672

JUN 1 1915

THE DUPLEX HANGER COMPANY

CLEVELAND-OHIO-U-S-A

DUPLEX STEEL AND MALLEABLE IRON POST CAPS
CLEVELAND WALL TIES

SOLE MANUFACTURERS OF THE DUPLEX JOIST AND WALL HANGERS

MAIN OFFICE & WORKS
EAST 53RD AND LAKESIDE AVE.

Sole Manufacturers of the Duplex Joist and Wall Hangers, Post Caps, Wall Plates, Post Bases and Wall Boxes of Every Kind, both in STEEL and MALLEABLE IRON, for Use in the Erection of HEAVY MILL CONSTRUCTED Warehouses, and Factory Buildings, as well as in Ordinary Joist Constructed Buildings. Also Shaft Hangers and Pipe Hangers for Reinforced Concrete Construction, Wall Ties, Wall Anchors, Straps, etc.

General Office and Works, East 53d Street and Lakeside Avenue.
Agencies in all large Cities in United States, also Canada and at Frankfurt, A. M., Germany.

WARNING

THE DUPLEX HANGER CO., of CLEVELAND, OHIO, are the only parties who manufacture the patented articles illustrated in these pages. All others are warned against making any of the forms, as their use infringes the rights secured by this Company by Letters Patent, and renders each individual user of such material, be he the Contractor, Builder, or Owner, responsible for such unlawful use and all the consequences thereof, and liable to suit therefore.

INDEX

THE DUPLEX HANGER COMPANY

IT has been our endeavor to make this edition of our catalogue a useful hand-book of information for the use of Architects and Builders. We therefore publish herewith tests made by prominent Universities as well as reports on tests of material in actual construction, also, the Report of Fire Tests made by the Underwriters' Laboratories at Chicago, on Wall Hangers and Post Caps designed for mill construction work.

We furnish Duplex Post Caps and Wall Hangers with the Underwriters' Label, as shown herewith.

Remember, when you build a mill construction building that Duplex Post Caps and Duplex Wall Hangers, with this label, will reduce your insurance rates. All of the Associated Factory Mutual Fire Insurance Companies place insurance on buildings constructed with Duplex Post Caps and Hangers.

Duplex construction is used in buildings throughout the entire United States and Canada, as well as in a number of foreign countries.

We have the approval of the Buildings Codes in all the large Cities, and we point with pride to the recommendation of the many prominent Architects and Engineers who have specified and used our devices in the past. In the manufacture of our goods, we use only the very highest grade of Malleable Iron and Open Hearth Steel Plate.

Every Hanger is thoroughly tested. Hangers for heavy loads are all made with test lugs, which are bent cold, so as to demonstrate the superior quality of the Malleable Iron used.

Duplex Hangers and Post Caps being generally recognized by the trade as the Standard of High Class Construction, are now carried in stock by Dealers everywhere, and our goods can be secured without delay.

On account of the rapidly increasing demand for our goods, we were compelled to double the capacity of our factory, and are in position to give very prompt delivery on all special orders.

We carry a complete stock of all material shown in this catalogue and can make immediate shipment on all stock sizes.

We are also prepared to make special designs whenever requested by Architects and Engineers.

Duplex Joist Hanger
Each Hanger Tested

This design of Joist Hanger is made in the following sizes:

No. 10	To Carry Timbers	2 x 6	2 x 8	2 x 10
No. 14	" " "	2 x 12	2 x 14	2 x 16
No. 15	" " "	3 x 6	3 x 8	3 x 10
No. 18	" " "	2½ x 12	2½ x 14	2½ x 16
No. 20	" " "	4 x 6	4 x 8	4 x 10
No. 21	" " "		3 x 12	3 x 14
No. 21X	" " "	3 x 16	3 x 18	3 x 20
No. 28	" " "		4 x 12	4 x 14
No. 28X	" " "	4 x 16	4 x 18	4 x 20
No. 53	" " "	5 x 10	5 x 12	5 x 14
No. 53X	" " "		5 x 16	5 x 18
No. 16	" " "	6 x 6	6 x 8	6 x 9
No. 60	" " "		6 x 10	6 x 12
No. 60X	" " "		6 x 14	6 x 16
No. 80	" " "	8 x 8	8 x 10	8 x 12

Reports of Tests see pages 45 to 57.

DUPLEX JOIST HANGER DIMENSIONS

Special Notice. Bore holes for nipple "E," ⅛ in. larger. Frame Hanger at or above neutral axis.

	No. of Hanger	A	B	C	D	E	Lgt. Lug.
	10	2"	3"	5"	5⅝"	1"	1¾"
	14	2"	3"	5"	8"	1"	1¾"
	15	2"	3"	5"	5⅝"	1"	1¾"
	18	2½"	3"	5"	8"	1"	1¾"
	20	4"	3"	5"	5⅝"	1"	1¾"
	21	3"	3"	5"	8"	1"	1¾"
	21X	3"	3"	5"	10"	1"	1¾"
	28	4"	3"	5"	8⅛"	1"	1¾"
	28X	4"	3"	5"	10"	1"	1¾"
	53	5"	3"	5"	8⅛"	1"	1¾"
	53X	5"	3"	5"	10"	1"	1¾"
	16	6"	3"	5"	6"	1"	1¾"
	60	6"	3"	5"	8⅛"	1"	1¾"
	60X	6"	3"	5"	9⅛"	1"	1¾"
	80	8"	4"	5"	8⅛"	1"	1¾"

For Price List see Page 72

THE DUPLEX HANGER COMPANY

IT has been demonstrated

First—The Duplex Joist Hanger is superior to the old methods of framing by mortise and tenon. See Fig. A.

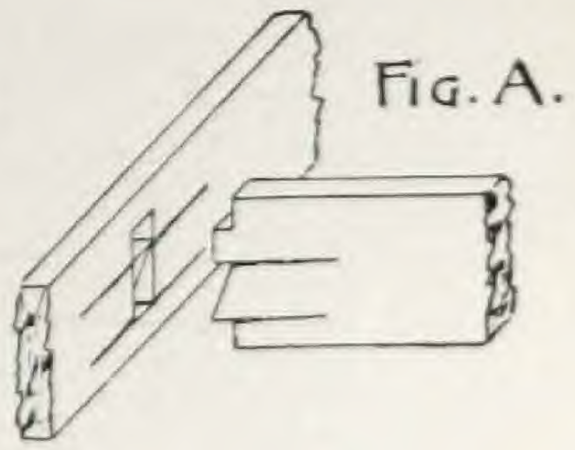


FIG. A.

Second—That in efficiency it surpasses the wrought iron stirrups and steel hangers. Figs. B and C.

Third—That it retains the full strength of the timber.

Fourth—That the method of framing with Duplex Hangers is cheaper and superior to all other methods of good construction.

Fig. A shows the best method of framing by mortise and tenon. When Joists are loaded to their carrying capacity they are sure to split, as indicated by sketch, even though framed by skillful and careful mechanics. The very heart is cut out of the header joist, and the joist framed into header loses its full bearing, and the carrying strength is reduced by a large percentage. If a mortise and tenon is not accurately made, which is most generally the case, it renders the construction too uncertain in character to be described.

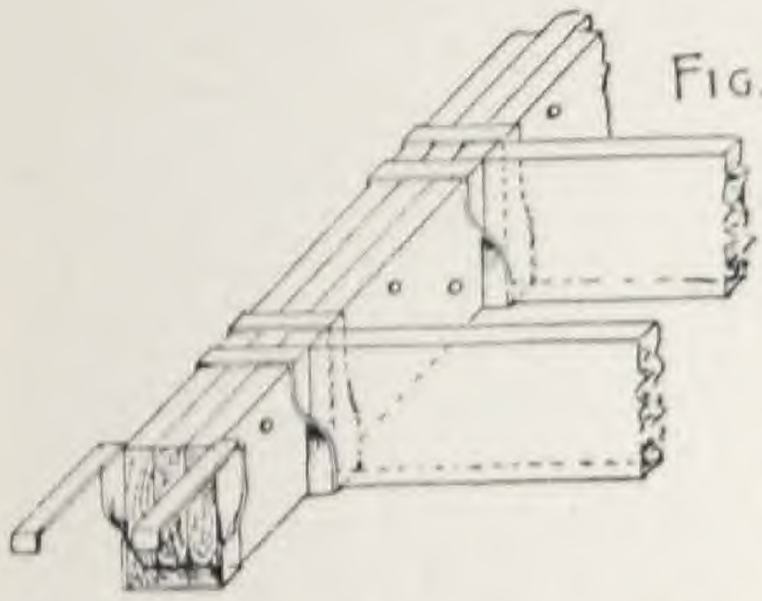


FIG. B.

Fig. B shows the method of framing with wrought iron stirrup and steel Hangers. The shrinkage of the timbers allows the joists to drop below the beam, and thereby cracking the ceiling and lowering the floor on either side of the beam. Numerous instances have occurred where floors had to be raised so as to make them level.

Fig. C and D demonstrates the condition of the beam and steel Hangers when a heavy load is applied. The weak point of a steel Hanger is the tendency to fail by bending and crushing of the wood at the point where it goes over the top of the beam. Numerous cases in actual practice, as well as every test, have fully demonstrated this fact.

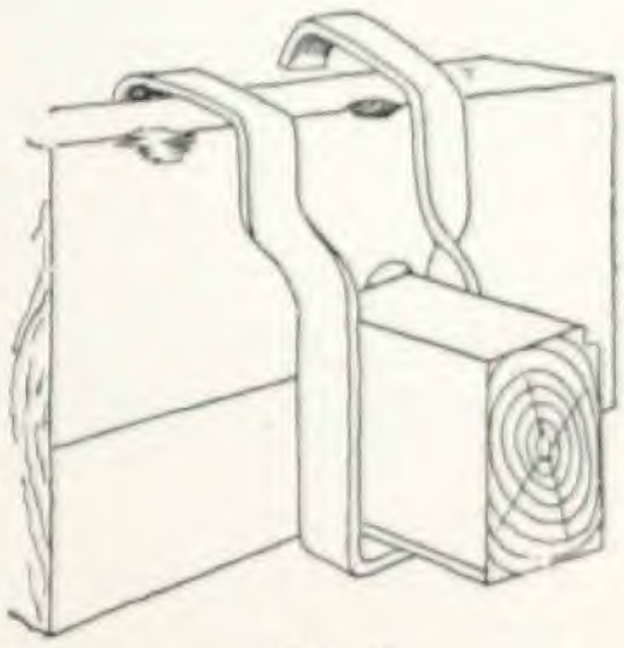


FIG. C

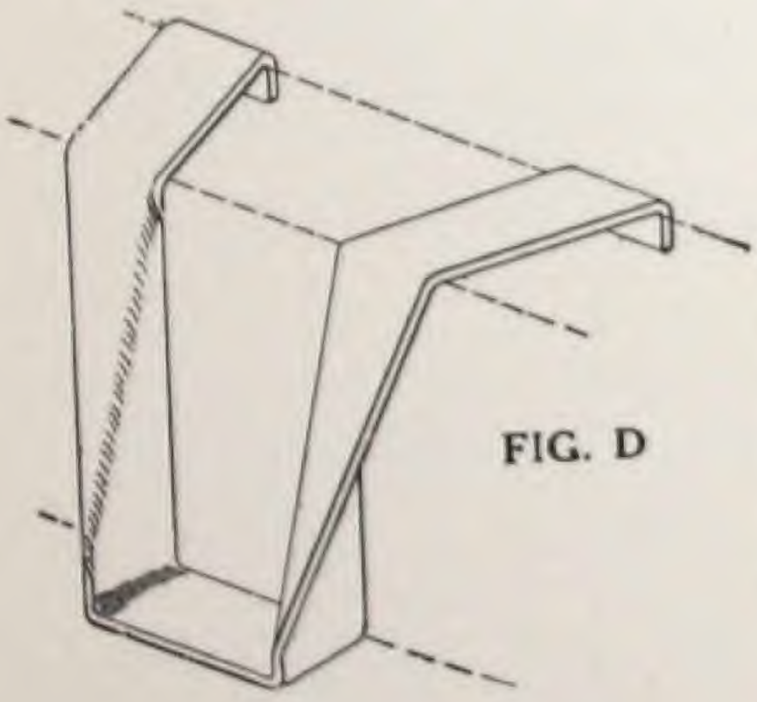


FIG. D

Fig. E illustrates the simple application of the Duplex Joist Hanger; as they can only be applied in one simple way, their presence gives positive assurance that the work has been executed as intended. The header is not weakened in the least, as the timber is bored at or above its neutral axis. The malleable lug fills the hole completely. It is a well known fact that all the wood above the neutral axis is in compression only, and as the hole is completely filled, there is no loss of strength.

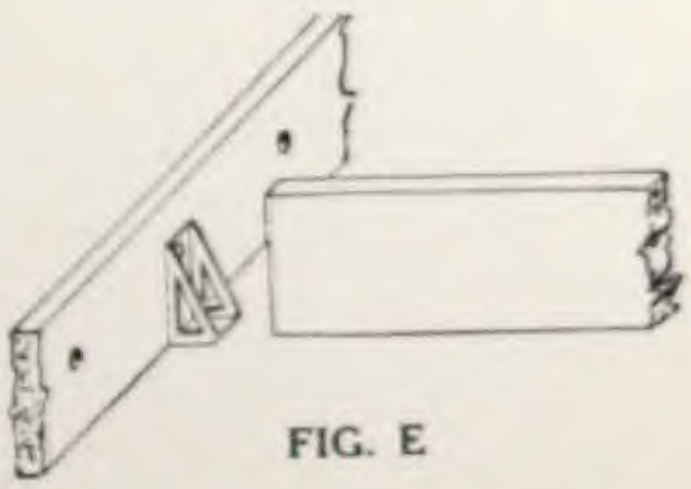
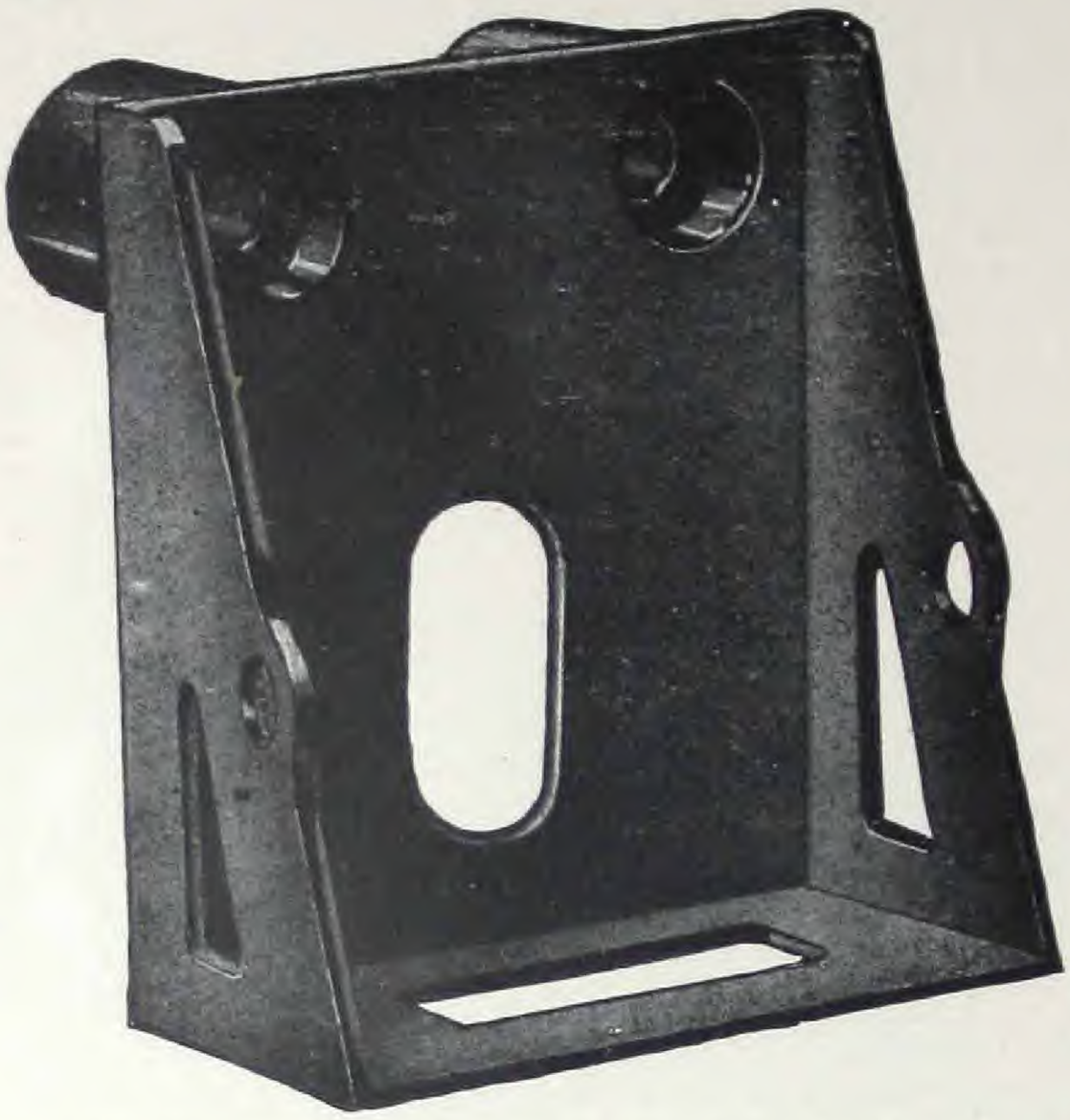


FIG. E

Duplex Hangers are standard construction and we publish on back cover a list of some of the large buildings wherein they are used.



Duplex Joist Hanger

Each Hanger Tested

At the request of Architects and Engineers we are now making this design of Joist Hanger for heavy mill construction work in one piece. It combines all the features of our No. 35 or 75 hangers, being made in one piece, however, instead of pairs.

This design of Joist Hanger is made in the following sizes:

No. 90	To Carry Timbers.....	8 x 14	8 x 16			
No. 91	" " "	10 x 10	10 x 12	10 x 14		
No. 92	" " "	10 x 16	10 x 18	10 x 20		
No. 93	" " "		12 x 14	12 x 16	12 x 18	12 x 20

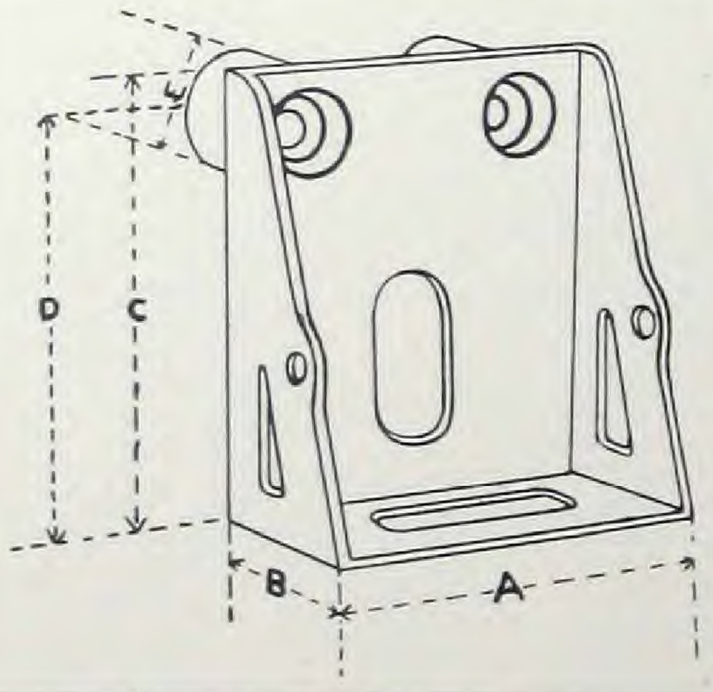
The Hanger is bolted to the girder with ⅝ inch diameter bolt as shown on illustration, page 9. Countersunk holes being provided so as to permit the bolts to fit into the hanger. Either bolts or lag screws of ½ inch diameter are used to tie the beam to the hanger.

By the use of this construction the entire building is tied together laterally. No other method of construction accomplishes this.

For reports of tests, see pages 45 to 57.

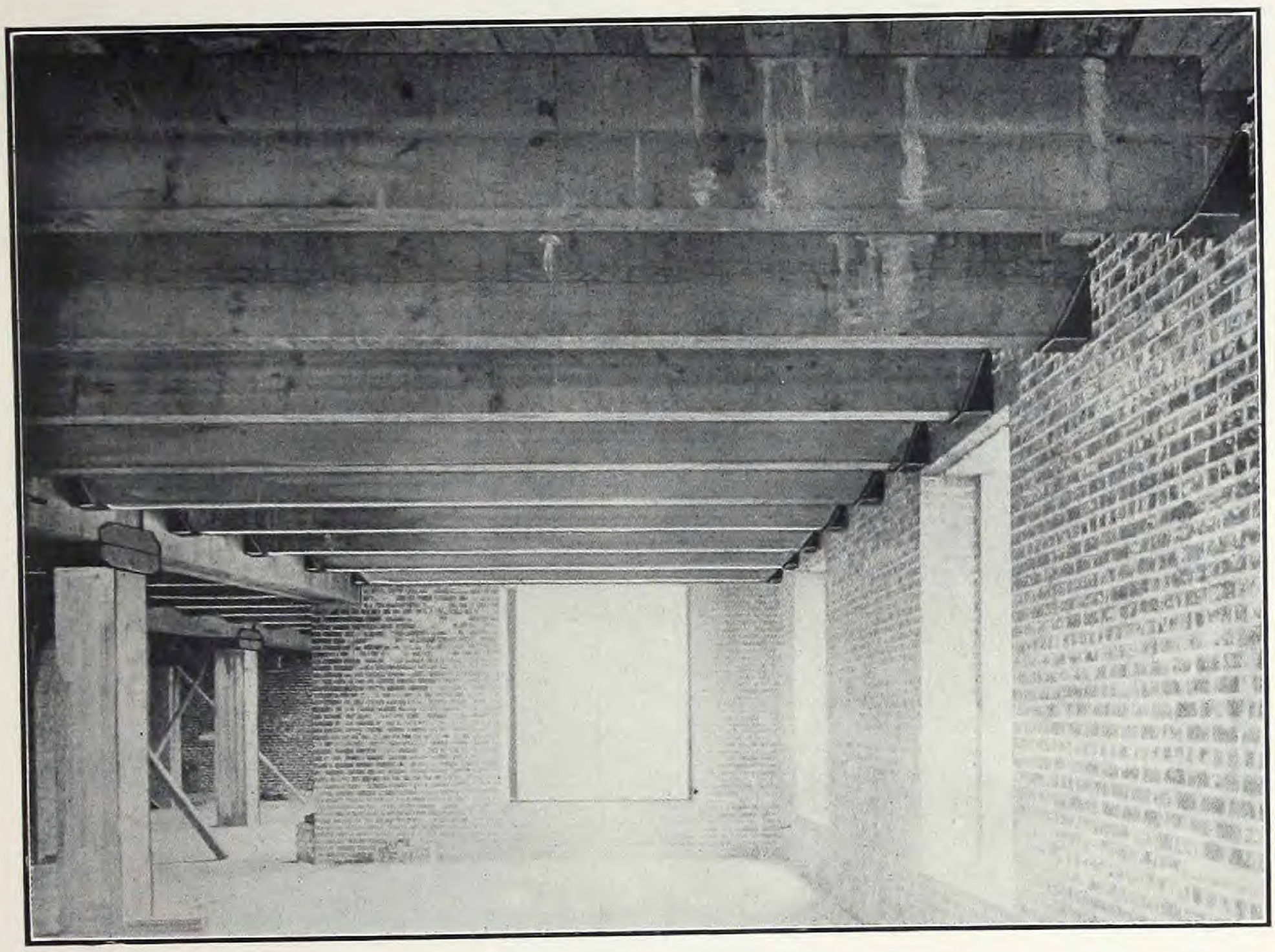
DUPLEX JOIST HANGER DIMENSIONS

Special Notice. Hangers must be framed *at or above* the neutral axis. Bore holes for nipple $\frac{1}{16}$ inch larger than given in "E."



No. of Hanger	A	B	C	D	E	Length of Lug
90	8″	4″	9½″	8″	2⅜″	3″
91	10″	4″	8¼″	7″	2⅜″	3¼″
92	10″	4¼″	11½″	10″	2½″	3½″
93	12″	4½″	11½″	10″	2⅞″	3½″

For Price List see Page 72.



A MODEL MILL CONSTRUCTION WAREHOUSE

This building as shown in the accompanying photograph is considered an excellent design to follow in warehouse or factory construction. The floors are designed to carry 400 pounds per square foot.

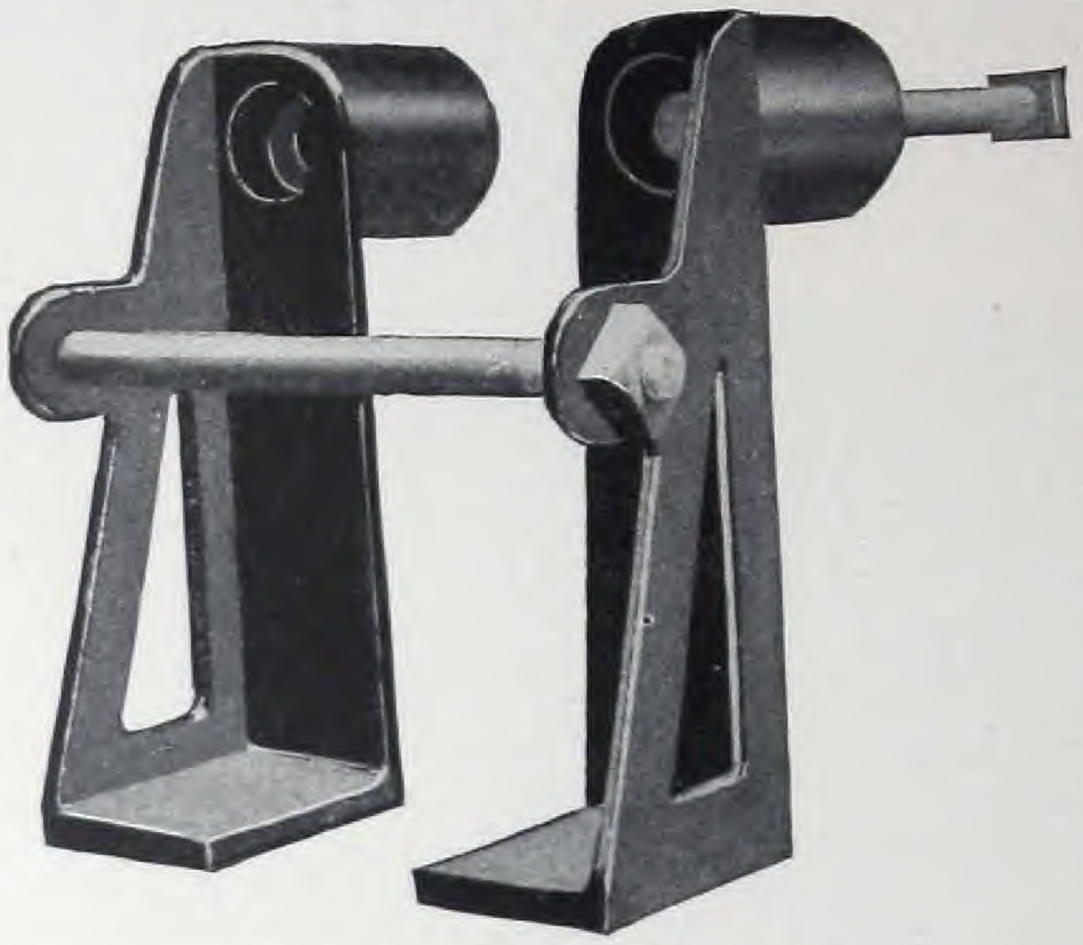
Posts are 20 x 20. Girders, 20 x 20. Beams, 8 x 16.

Duplex Steel Postcaps.

No. 800 Duplex Extra Heavy Wall Hangers.
No. 90 Duplex Joist Hangers are used throughout.

DUPLEX JOIST HANGER

Each Hanger Tested



Used in Pairs.
Especially Adapted For
MILL CONSTRUCTION

This design of Joist Hanger is made in the following sizes:

No. 25 R. and L.	To Carry Timbers.....	6 x 6	6 x 8	6 x 9	8 x 8	8 x 9
No. 35 R and L.	" " "	8 x 10 9 x 12	8 x 12 9 x 14	8 x 14 10 x 10	9 x 10 10 x 12	10 x 14
No. 75 R. and L.	" " "	10 x 16 12 x 16 14 x 18	10 x 18 12 x 18 14 x 20	10 x 20 12 x 20	12 x 12 14 x 14	12 x 14 14 x 16
No. 77 R. and L.	" " "	10 x 22 14 x 24	10 x 24 16 x 16	12 x 22 16 x 18	12 x 24 16 x 20	14 x 22 16 x 22

The Hangers are bolted to the girders with 5/8 and 3/4 inch bolts, countersunk holes being provided so as to permit the bolts to fit into the Hangers.

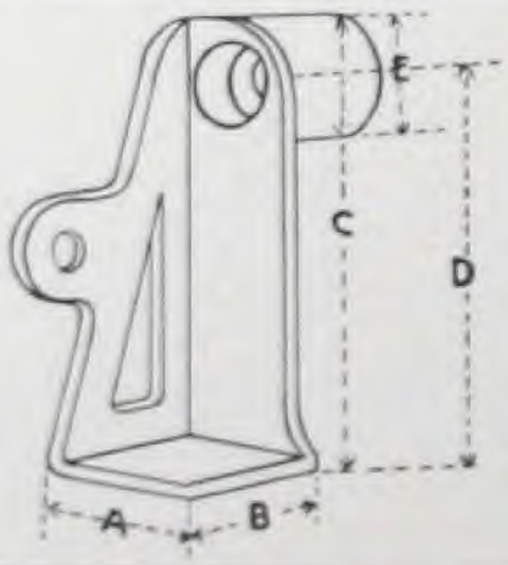
Either bolts or lag screws 1/2 inch diameter are used to tie the beam to the hangers.

By the use of this construction the entire building is tied together laterally. No other method of construction accomplishes this.

For report of tests, see pages 45 to 57.

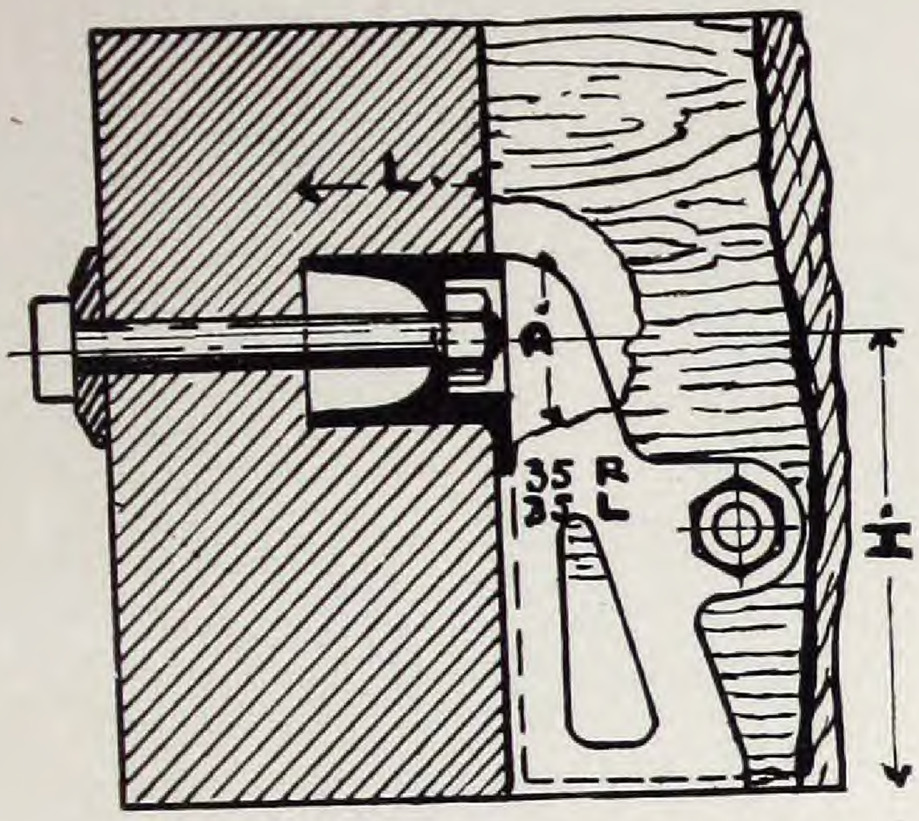
DUPLEX JOIST HANGER DIMENSIONS

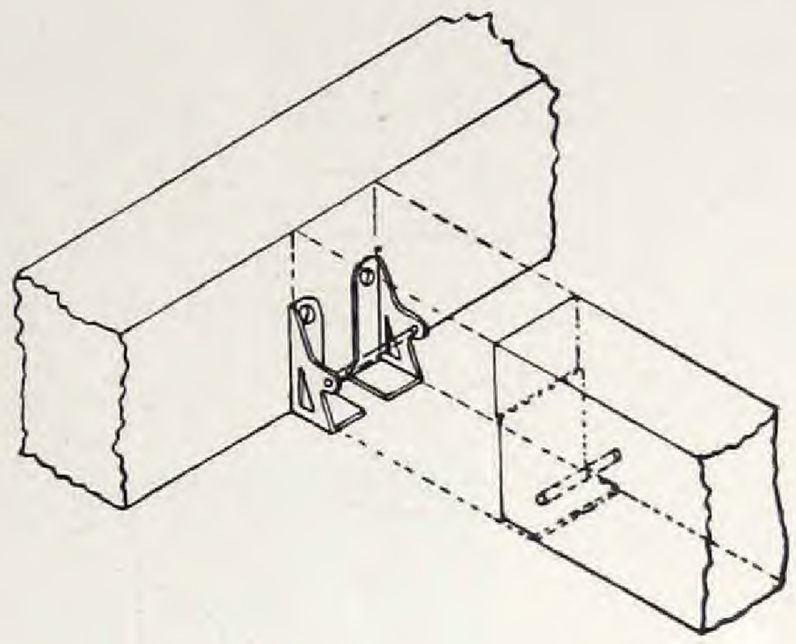
Special Notice. Hangers must be framed *at or above* the neutral axis. Bore holes for nipple 1/4 inch larger than given in "E." Hangers should fit loose.



No. of Hanger	A	B	C	D	E	Length of Lug
25	.....	3 1/4"	6"	4 3/4"	2 1/4"	3 1/4"
35	.....	3 3/4"	8 1/4"	7"	2 3/8"	3 1/4"
75	.....	4 1/4"	11 1/2"	10"	2 7/8"	3 1/2"
77	.....	5"	14 1/2"	13"	3"	3 1/2"

For Price List see Page 72.





Front view and section of Duplex Joist Hangers, No. 35 and 75, illustrating the manner in which they are bolted in pairs to the girders. For heavy construction the beams should either be bolted to the hangers or 5/8-inch lags should be used.

WHAT AN EMINENT AUTHORITY SAYS IN REGARD TO THIS CONSTRUCTION

Mr. F. E. Kidder, the renowned author, states on page 713 in the Architects' & Builders' Pocket Book, 1905 Edition:

CONNECTION OF FLOOR BEAMS AND GIRDERS.

"To render the construction slow burning and particularly the girders, it is important that there be no hollow space between the top of the girders and the flooring, or that the TOPS OF THE FLOOR BEAMS SHALL BE FLUSH WITH THE TOP OF THE GIRDER. This of course necessitates framing of the floor beams to the girders. For heavy construction the only kind of framing that is permissible is by means of some form of joist hanger. The various forms of joist hangers now in the market have been illustrated and commented on in Chapter XXI. When the floor beams are 6-in. x 12-in. or larger, and the girders are of wood, THE AUTHOR WOULD GIVE PREFERENCE TO THE DUPLEX HANGER SHOWN IN FIG. 18.

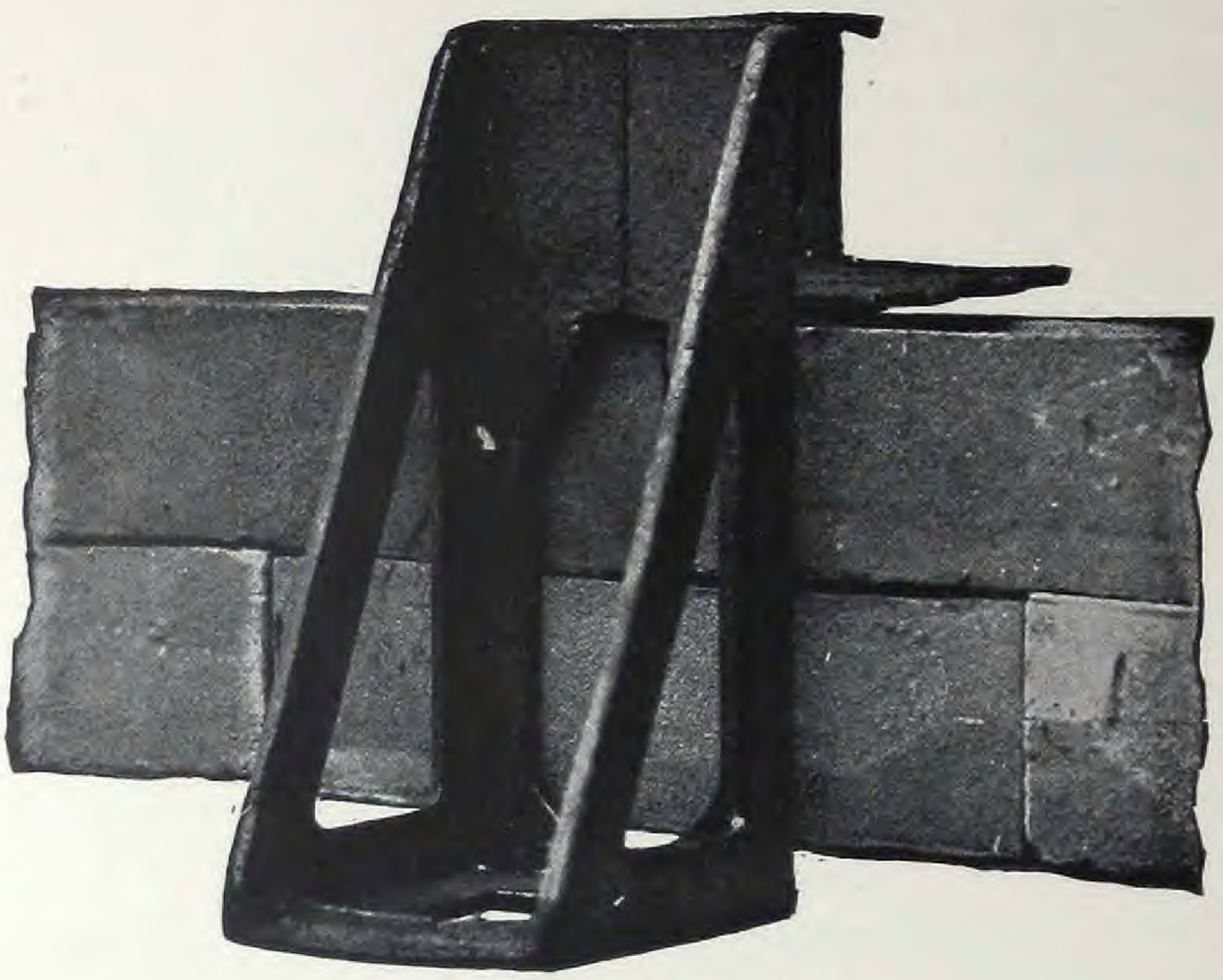
All headers six feet long or over should be carried in joist hangers or stirrups, and in warehouses and all first-class buildings all framing should be done by means of joist hangers. If stirrups are used the following sizes of iron should be used for the size of joist to be supported. Section of stirrups and sizes of joist to be supported:

2 x 8 to 3 x 10	1/4 x 2 1/2
3 x 12 to 6 x 12	3/8 x 3
4 x 12 to 4 x 14	1/2 x 3 1/2
6 x 14	1/2 x 4
8 x 14 to 10 x 14	5/8 x 4

Aside from the matter of strength, there are objections to the use of stirrups in that if the timber on which they rest is not perfectly dry the stirrups will settle an amount equal to the shrinkage of the beam on which it rests, and let the header down with it; the projection of the iron above the top of the timber necessitates cutting out the flooring, and when the stirrups are exposed they do not present a neat appearance. When Duplex Hangers are used the effect of shrinkage is reduced to one-half and the other two objections to the stirrup, previously mentioned, are overcome. The Duplex Hanger has ridges on the inside of the side brackets to hold the beam.

Duplex Wall Hanger

Each Hanger Tested



This design of Wall Hanger is made in the following sizes:

No. 100	To Carry Timbers.....	2 x 6	2 x 8	2 x 10	2 x 12
No. 140	" " "	2 x 14	2 x 16	2 x 18	
No. 180	" " "	2½ x 10	2½ x 12	2½ x 14	2½ x 16
No. 150	" " "	3 x 6	3 x 8	3 x 10	
No. 210	" " "	3 x 12	3 x 14	3 x 16	3 x 18
No. 200	" " "	4 x 6	4 x 8	4 x 10	
No. 280	" " "	4 x 12	4 x 14	4 x 16	4 x 18

For report of tests, see pages 46 to 48.

DUPLEX WALL HANGER DIMENSIONS

No. of Hanger	A	B	C	D	E
100	2″	3½″	3½″	2½″	3½″
140	2″	4″	5½″	2½″	4″
180	2½″	4″	5½″	2½″	4″
150	3″	3½″	3½″	2½″	3½″
210	3″	5″	5½″	2½″	4″
200	4″	3½″	3½″	2½″	3½″
280	4″	5″	3″	5¼″	4″

For Price List see Page 71.

THE DUPLEX HANGER COMPANY

DUPLEX WALL HANGER

THE substitution of the Duplex Wall Hanger for the old style method of anchoring timbers to masonry walls marks another valuable improvement which is now taking place in building construction.

Many schemes have already been devised by others, but as a rule were failures because they were not designed in accordance with well established requirements for good building construction.

In order to meet the demands made upon us, it was necessary to construct a device that:

First—A regular bond of masonry should not be broken.

Second—To increase the bearing of timbers on the walls.

Third—To maintain a secure anchorage.

Fourth—To reduce possible dry-rot to a minimum.

Fifth—To render timbers self-releasing in case of fire.

Sixth—To afford an opportunity to replace timbers after a fire without cutting into masonry walls.

The need of constructing mercantile buildings in a manner to make the joists self-releasing in case of fire, has been well demonstrated by the many conflagrations made so disastrous by falling walls.

The Duplex Wall Hanger is the only device which fulfills the requirements to the full and entire satisfaction of all concerned, and as a proof, the universal mercantile schedule of the Board of Underwriters allows a reduction of 1 per cent in the rate of insurance for mercantile buildings in which Duplex Wall Hangers are used. See letters, pages 42-43.

Why the Duplex Wall Hanger is the Only Proper Anchor for a Brick Building

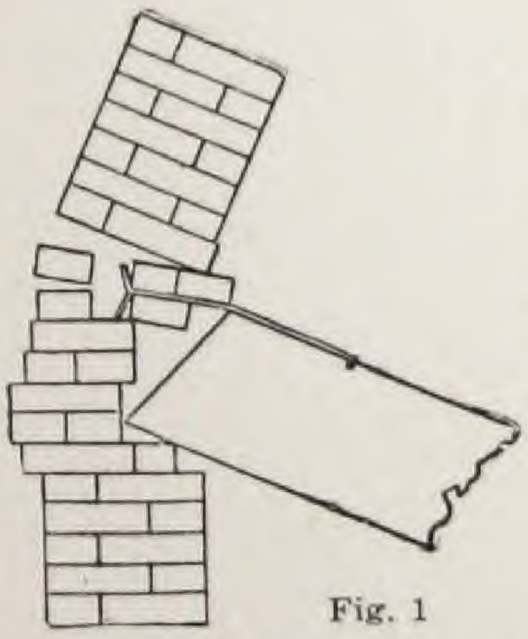


Fig. 1

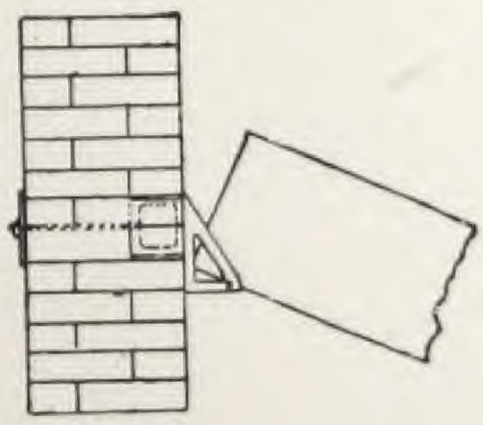


Fig. 2

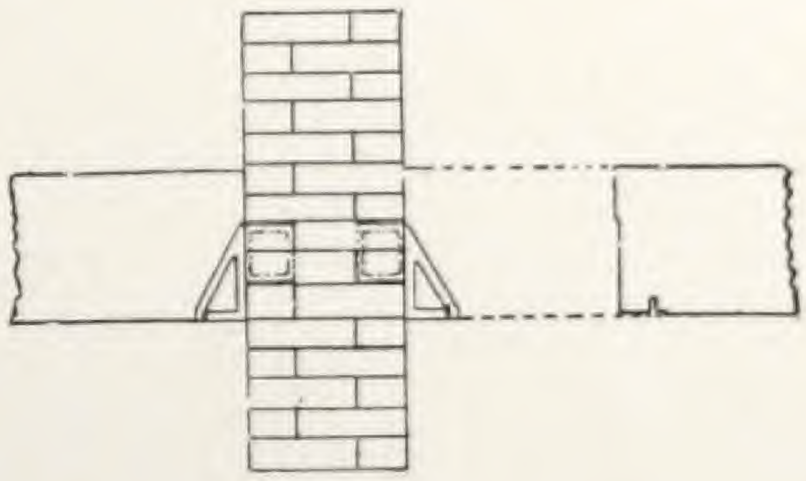


Fig 3

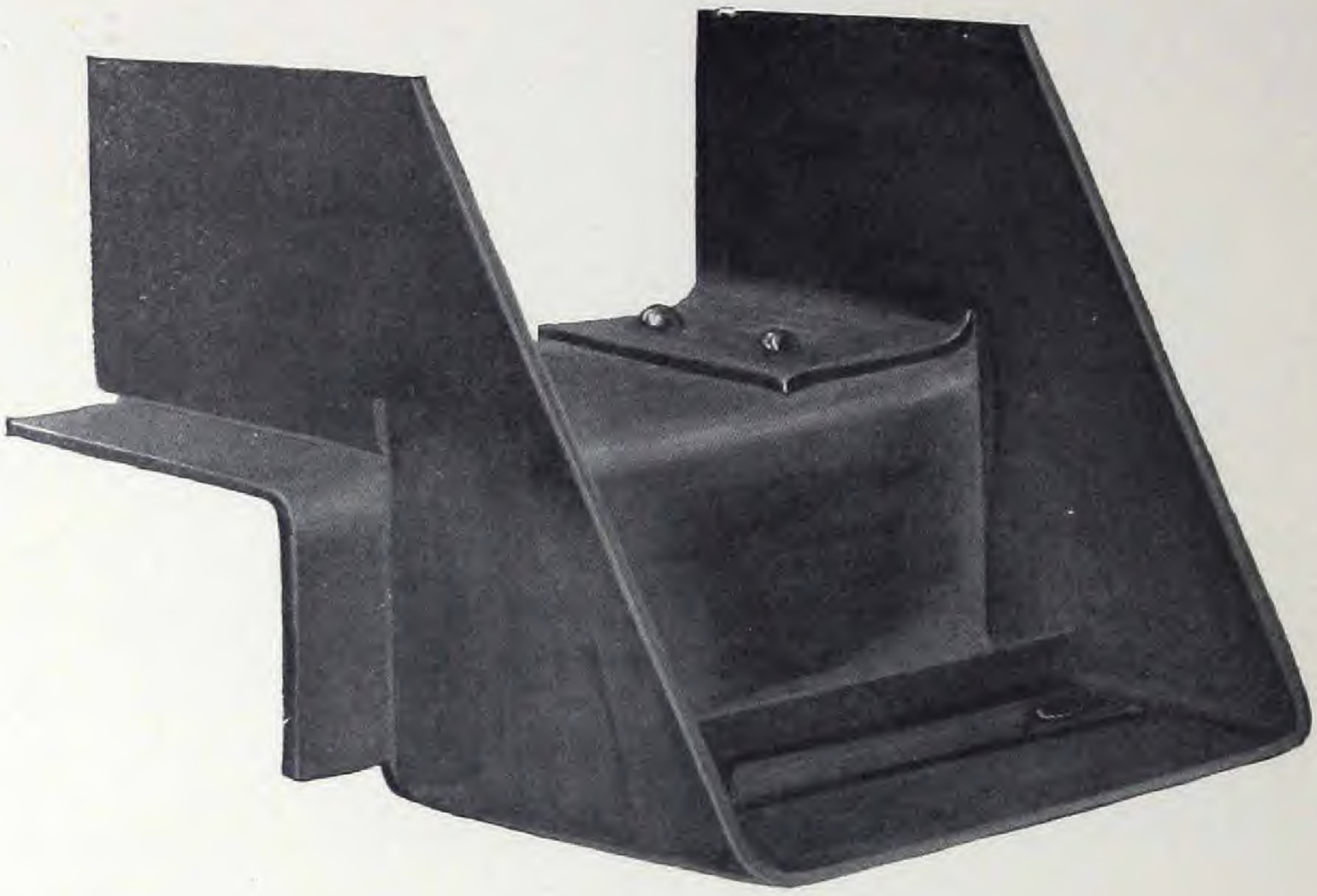
Fig. 1 illustrates the methods commonly used for anchoring joist to masonry wall, by which the wall is certain to be overthrown if joists should fall in case they are burned off.

Fig. 2 illustrates the use of the Duplex Wall Hanger, by which a better anchor is made and every joist is anchored to hanger in a manner which makes the timber self-releasing in case of fire. Provision is made for attaching anchors to wall hangers.

Fig. 3 illustrates the application of the Duplex Wall Hanger in a 12-in. party wall, there being no joist or wood work built in, the wall forms a perfect party and fire wall, complying in every respect with the most rigid building laws.

In the same manner of construction an 8-in. wall would be much stronger and form a better party or fire wall than a 12-in. wall with the joist built in from both sides, as in the ordinary construction.

DUPLEX WALL HANGER

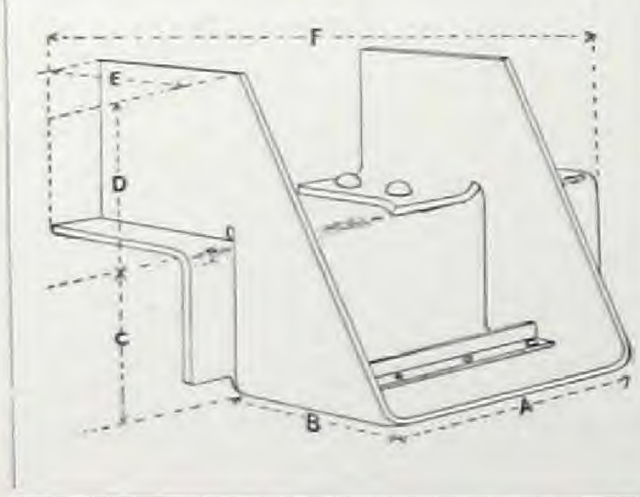


This design of Wall Hanger is manufactured of open hearth steel plate and in the following sizes:

No. 500	To Carry Timbers.....	5 x 8	5 x 10	5 x 12	5 x 14	5 x 16
No. 600	" " "	6 x 8	6 x 10	6 x 12	6 x 14	
No. 800	" " "	8 x 8	8 x 10	8 x 12		
No. 1000	" " "	10 x 10	10 x 12			

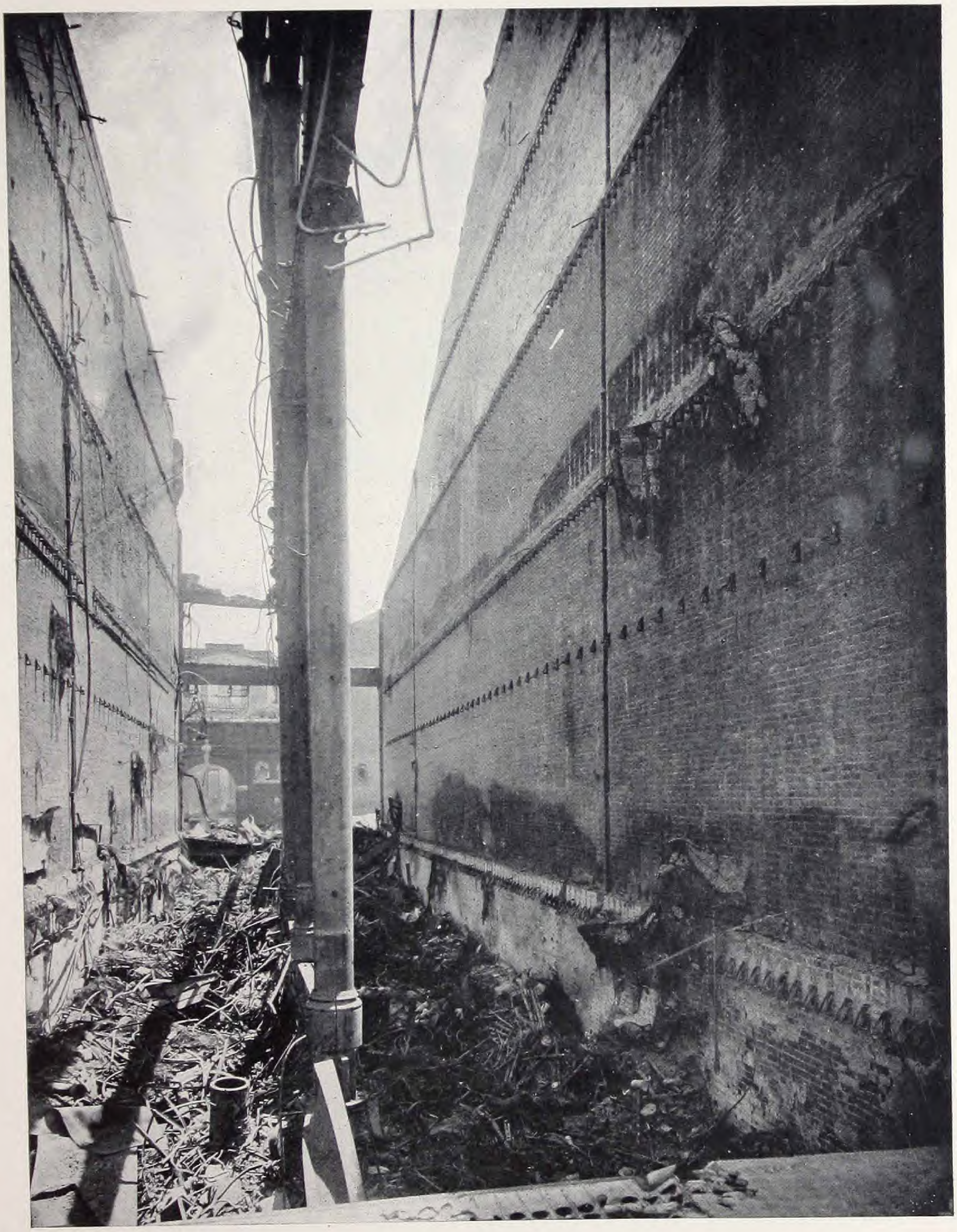
For report of tests, see pages 46 to 48.

DUPLEX WALL HANGER DIMENSIONS



No. of Hgr.	A	B	C	D	E	Dimension of Bearing Plate On Wall
500	5″	5″	4″	4¾″	5″	8 x 5″
600	6″	5″	4″	4¾″	5″	9 x 5″
800	8″	5½″	4″	4¾″	5″	11 x 5″
1000	10″	5½″	4″	4¾″	5″	13 x 5″

For Price List see Page 71.



A demonstration in reality of the self-releasing features of Duplex Wall Hangers. This photograph shows the walls and hangers intact, in perfect condition, to be used in rebuilding. This is the reason of *LOWER INSURANCE* when Duplex Wall Hangers are used

DUPLEX WALL HANGER

For Heavy Mill Construction

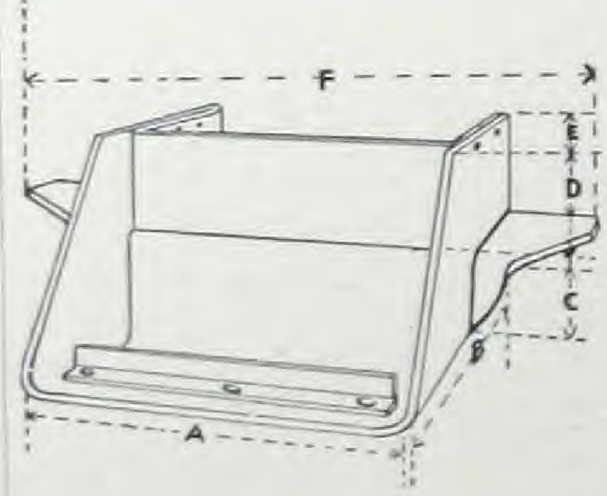
8″ Bearing on Wall and 8″ for Girder

This design of Wall Hanger is manufactured of open hearth steel plates and in the following sizes:

No. 600	Extra Heavy, to Carry Timbers	6 x 16	6 x 18	6 x 20	
No. 800	" " " " "	8 x 14	8 x 16	8 x 18	8 x 20
No. 1000	" " " " "	10 x 14	10 x 16	10 x 18	10 x 20
No. 1200	" " " " "	12 x 14	12 x 16	12 x 18	12 x 20
No. 1400	" " " " "	14 x 14	14 x 16	14 x 18	14 x 20
No. 1600	" " " " "	16 x 16	16 x 18	16 x 20	
No. 1800	" " " " "	18 x 18	18 x 20		

For report of tests, see pages 46-48, 58, 63.

DIMENSIONS OF EXTRA HEAVY DUPLEX WALL HANGERS



No. of Hanger	A	B	C	D	E	Size of Bearing Plate on Wall
600 Exh.	6″	6″	4″	4¾″	8″	8 x 9
800 Exh.	8″	7″	4″	4¾″	8″	8 x 11
1000 Exh.	10″	8″	4″	4¾″	8″	8 x 13
1200 Exh.	12″	8″	4″	4¾″	8″	8 x 20
1400 Exh.	14″	8″	4″	4¾″	8″	8 x 22
1600 Exh.	16″	9″	4″	4¾″	8″	8 x 24
1800 Exh.	18″	9″	4″	4¾″	8″	8 x 26

For Price List, see Page 71.

THE DUPLEX HANGER COMPANY

IN A PAPER read by Mr. F. E. Kidder at a special meeting of the Colorado Chapter of the A. I. A. on Feb. 27th, 1903, he discussed the merits of Joist and Wall Hangers, and in conclusion said:

"In regard to Wall Hangers the same principles apply to them as to Joist Hangers, the best being that which is so designed as to most perfectly distribute the load over the bearing surface of the masonry, while at the same time possessing the requisite tensile strength in the sides and bottom.

"For *distributing the weight on the wall there is certainly no Wall Hanger now on the market which approaches the Duplex* and if *Steel Hangers* could be economically made on the same pattern they would give the *Ideal* construction."

Following out this suggestion, we experimented for years, until we finally succeeded in designing the *DUPLEX STEEL WALL HANGER shown in these pages,* securing patents on July 2d, 1907.

This design gives even greater bearing than the malleable hanger formerly made by us.

The use of Wall Hangers for mill construction work has since become almost universal.

In Kidder's Architects' and Builders' Pocket Book of 1905, we note the following:

Mr. Kidder in his latest work on construction says: *"For distributing the weight on the wall there is certainly no wall hanger now on the market which approaches the DUPLEX."*

On page 714 he states: *"In a warehouse intended to be constructed on slow burning principle the floor beams and girders should be anchored to and supported by the walls in such a way that in case the beams are burnt through the ends may fall without injuring the wall, and where large timbers are used provision should be made against the possibility of dry-rot."*

Page 717: *"Figs. 24 and 25 show Duplex Hangers for large timbers. The hanger shown in Fig. 25 is made extra heavy and is provided with a plate that has eight inches of bearing on the wall and the bearing of the timbers on the hanger is also eight inches. For beams not exceeding ten inches in breadth there is probably little choice between box anchors and wall hangers, except perhaps in price and appearance. When the wall hanger is used no hole is left in the wall and the saving of six inches in the length of the timber is effected, which in some cases would be a consideration. For girders 12 x 14 and upwards the author believes the Duplex Hanger to be preferable to the box anchor. Wall hangers made from stirrups should not be used for heavy beams."*

THE DUPLEX HANGER COMPANY

DUPLEX I-BEAM HANGER

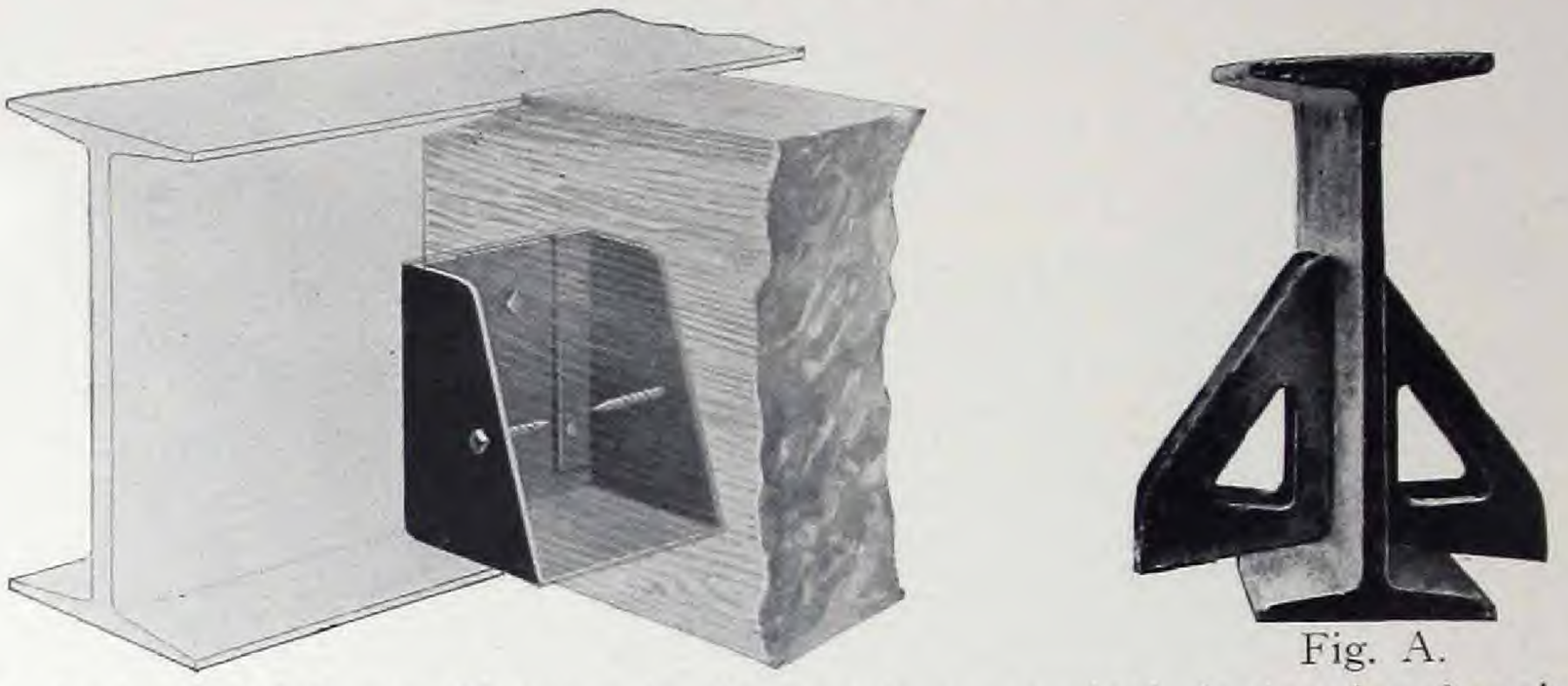
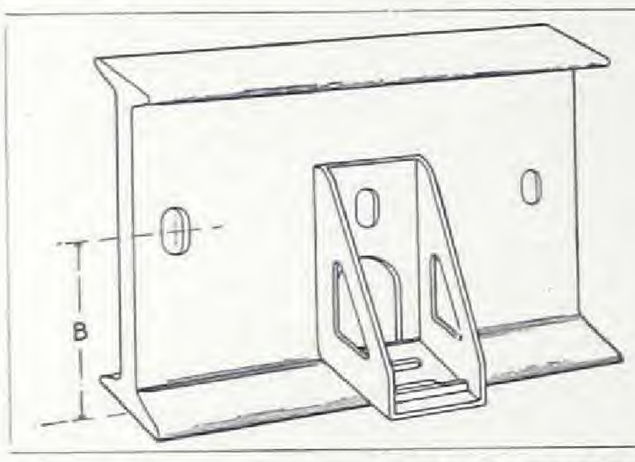


Fig. A.

This design of I-Beam Hanger is the most economical device for framing wood joists to I-Beams. All the weight is carried directly on the lower flange of the I-Beam, which is the only correct method.

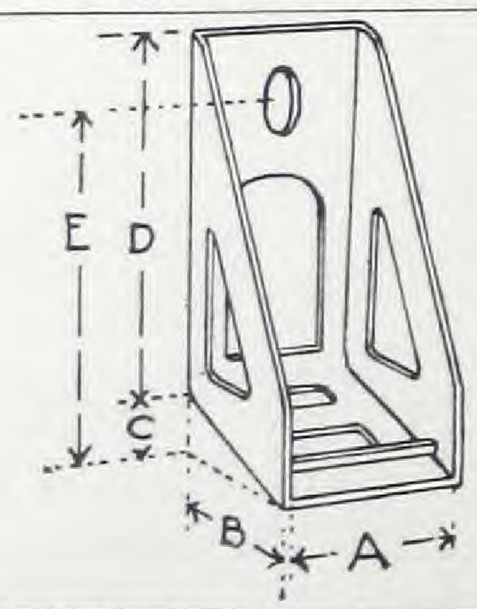


It is manufactured in the following sizes:

No. 2	to carry timbers	2 "	wide any height
No. 2½	" " "	2½"	" " "
No. 3	" " "	3 "	" " "
No. 4	" " "	4 "	" " "
No. 5	" " "	5 "	" " "
No. 6	" " "	6 "	" " "
No. 8	" " "	8 "	" " "

DIMENSIONS OF DUPLEX I-BEAM HANGER

Special Notice. To attach Duplex I-Beam Hangers to I-Beams punch ¾-inch holes 6 inches from the bottom of the I-Beam as shown on drawing "B." The slotted hole in the Hanger will take up the variation of any Beam.



No. of Hanger	A	B	C	D	E
2	2"	4½"	⅙B"	7½"	6"
2½	2½"	4½"	⅙B"	7½"	6"
3	3"	4½"	⅙B"	7½"	6"
4	4"	4½"	⅙B"	7½"	6"
5	5"	4½"	⅙B"	7½"	6"
6	6"	5"	⅙B"	7½"	6"
8	8"	5"	⅙B"	7½"	6"

As shown in Fig. A, our hangers fit exactly into the flange of the I-Beam. We provide for 4½-in. bearing of the joist on hangers. These hangers are made with a rib in bottom of hanger ⅜-in. high, which serves as a tie when the joist is placed in the hanger. All holes to attach Duplex I-Beam hangers to I-Beams are punched 6 inches from bottom of I-Beam.

Special Notice. When framing joists into Duplex I-Beam Hangers, please observe the following instructions: Bevel the bottom of joist ½-inch in three inches (1-6 pitch) which is uniformly the pitch of I-Beam flanges. Notch your joist for ⅜-inch rib in bottom of hanger. Use a ¾-inch bolt to fasten hanger to I-Beam. You will find a large opening in bottom of hanger for the purpose of furrowing. Bevel the end of joist to set same in place, as shown in Fig. C.

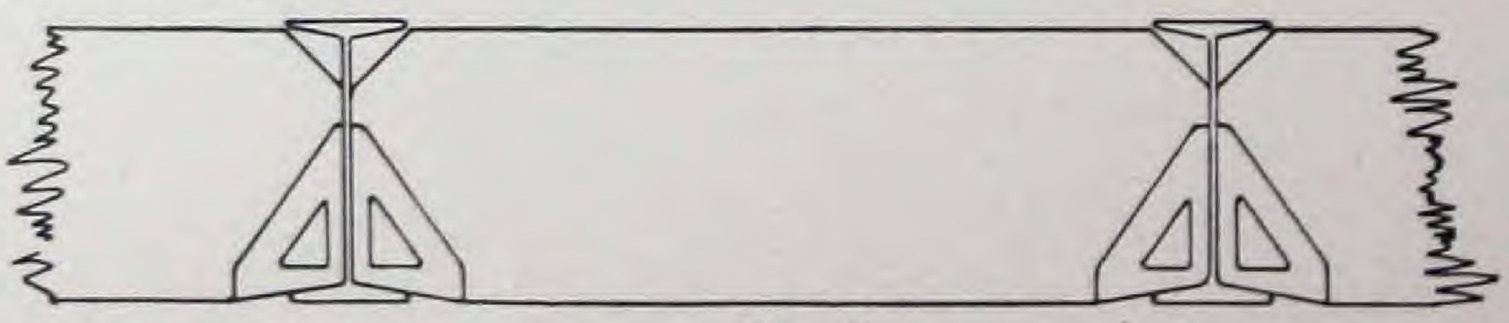


Fig. C.

For Price List see Page 72.

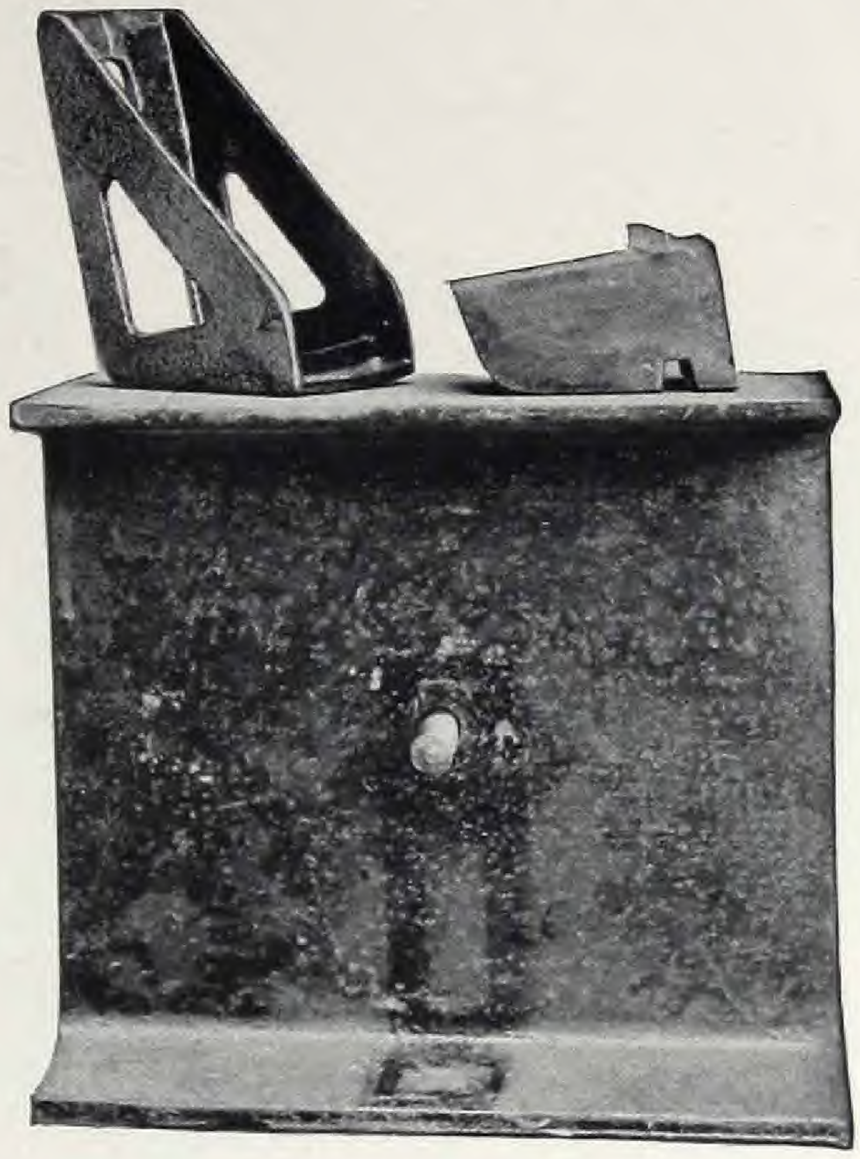


Fig. B.

Whenever it becomes necessary to frame a beam, 1, 2 or 3 inches above the lower flange of the I-Beam, we furnish either a box of the desired height as illustrated in Fig. B or the Duplex I-Beam shelf hanger as illustrated in Fig. D.

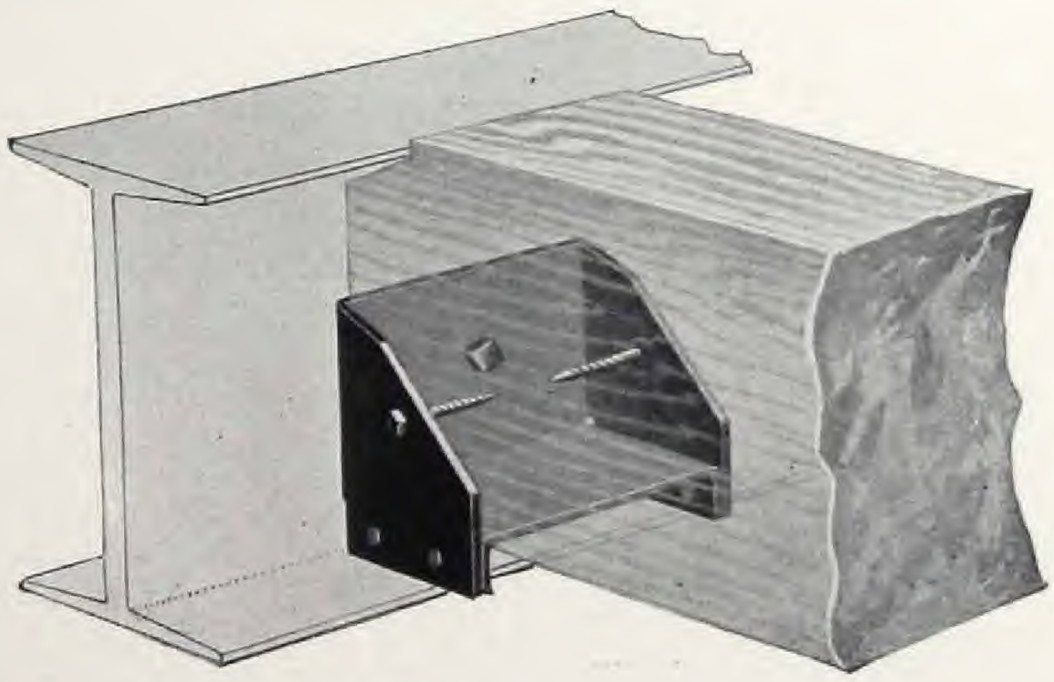


Fig. D.

DUPLEX I-BEAM SHELF HANGER

For construction requiring joist to be raised 1 inch to 4 inches above the lower flange of I-Beam. When the joist is framed higher than 4 inches above lower flange of I-Beam, use Duplex I-Beam Box Hanger as shown on page 18.

The shelf hanger is made of steel and the bearing is raised the necessary height to carry the joist.

To attach Duplex I-Beam Shelf Hangers to I-Beams ¾-inch holes are punched 6 inches from bottom of the I-Beam.

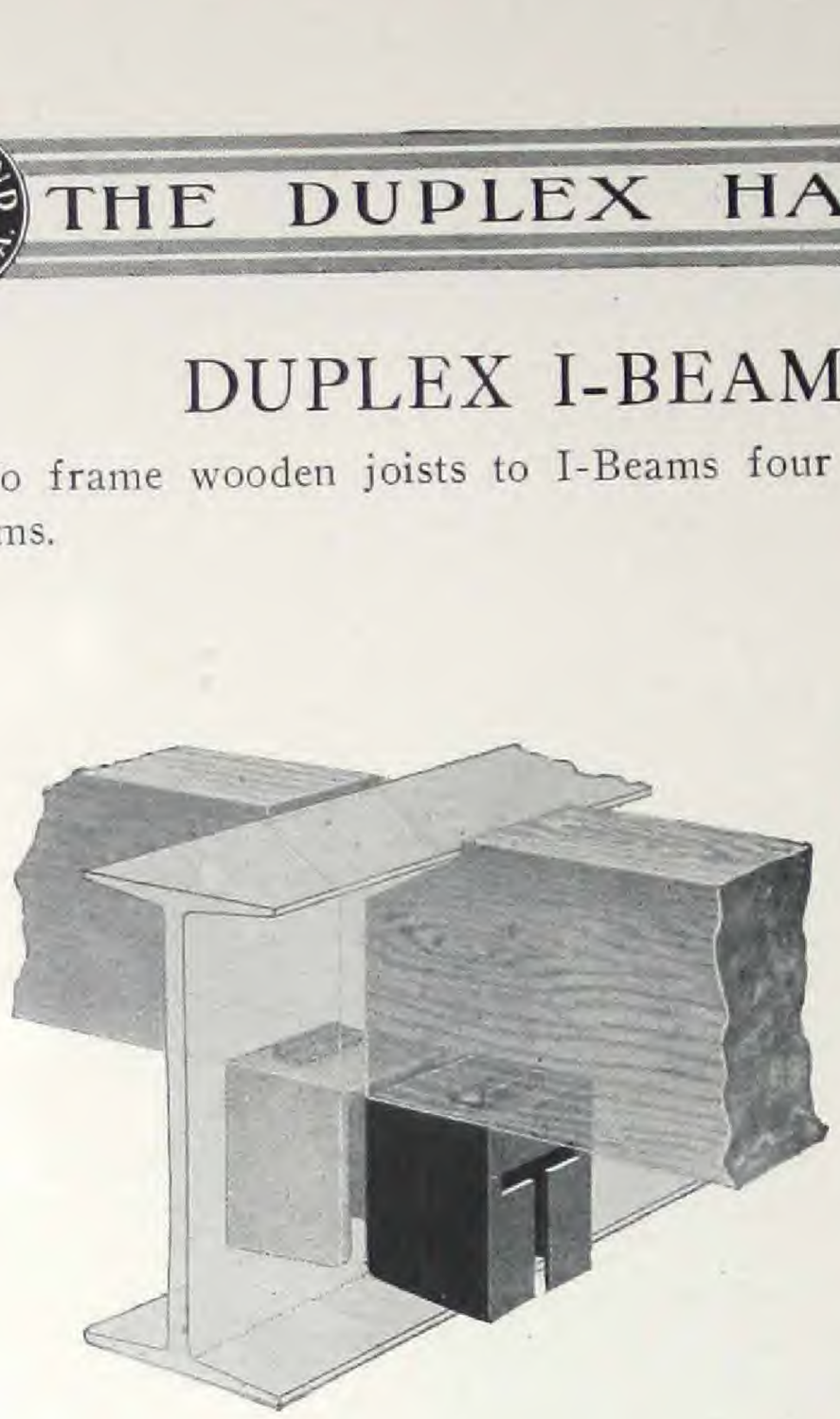
On account of variety of sizes we are unable to furnish list, but will quote on application.

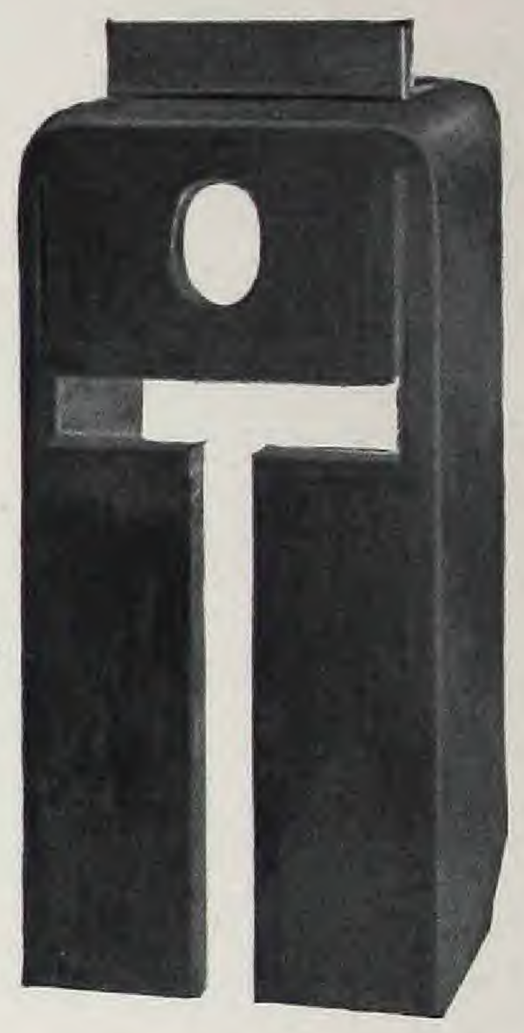
When sending an inquiry kindly give full information, namely: Size and weight of I-Beam, width and height of joist and also position of top of joist relative to top of I-Beam.

THE DUPLEX HANGER COMPANY

DUPLEX I-BEAM BOX HANGER

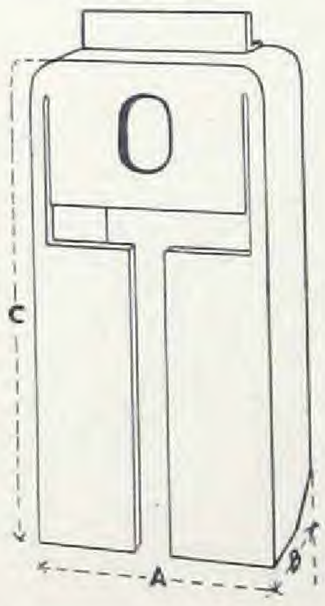
To frame wooden joists to I-Beams four inches or more above the lower flange of I-Beams.



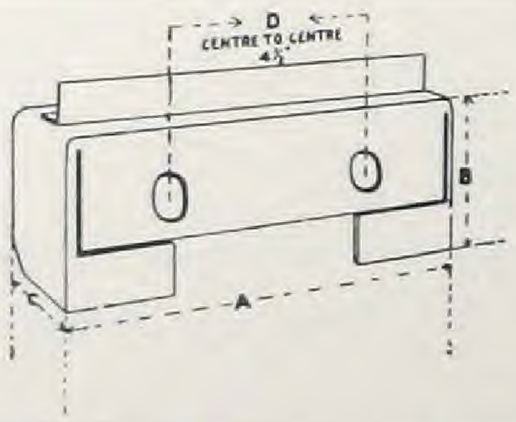


The Duplex I-Beam Box Hanger is bolted to I-Beam and rigidly attached. All the weight is carried on lower flange of I-Beam. The shearing of rivets so common when angles are riveted to I-Beams is avoided. The cost is much less. Large bearing for the wood joist is provided.

DIMENSIONS OF DUPLEX I-BEAM BOX HANGERS



Width of Joist	A	B	C
2″	2″	3″	Height of Hanger
3″	3″	3″	
4″	4″	3″	
5″	5″	3″	
6″	6″	3½″	



Width of Beam	A	B	C	D C to C
8″	8″	Height of Hanger	4″	4½″
10″	10″		4″	4½″
12″	12″		4″	4½″
14″	14″		4″	4½″

Note. ¾-inch bolts are used to attach the I-Beam Box Hangers to the I-Beam. Location of hoies to be punched in I-Beam will be furnished by us for the various sizes.

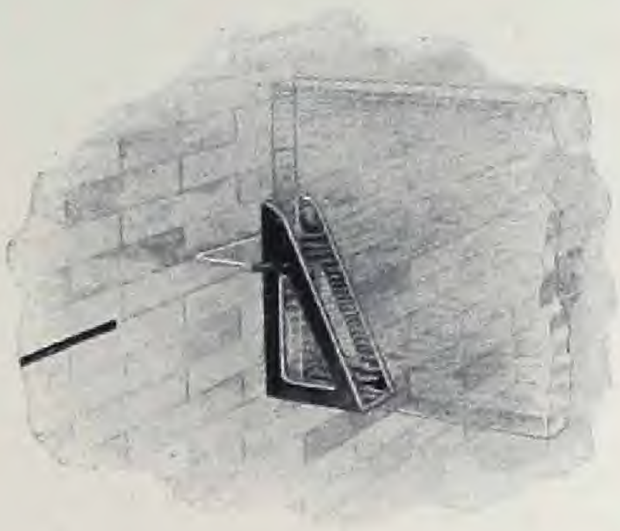
On account of variety of sizes we are unable to furnish list, but will quote on application.

When sending an inquiry kindly give full information, namely: Size and weight of I-Beam, width and height of joist and also position of top of joist relative to top of I-Beam.

THE DUPLEX HANGER COMPANY

DUPLEX CONCRETE BLOCK HANGER

EACH HANGER TESTED



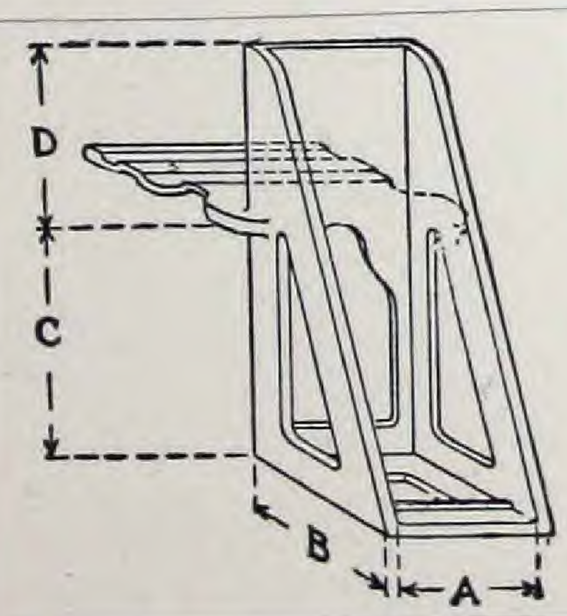
Is the best hanger for concrete block construction. It is made with a larger bearing than our ordinary wall hanger, so as to distribute the load over a greater area of the concrete block.

Also very practical for Hollow Block Tile Buildings, and for use in buildings where it becomes necessary to frame joists in old brick walls or party wall. This avoids the cutting of a large hole in the wall as the hanger can be grouted in cement mortar and will give a perfect bond.

For report of tests, see page 64.

This design of Hanger is made in the following sizes:

No. 9 To Carry Timbers.....	2 x 6	2 x 8	2 x 10	2 x 12	2 x 14
No. 11 " " "	3 x 6	3 x 8	3 x 10	3 x 12	3 x 14
No. 13 " " "	4 x 6	4 x 8	4 x 10	4 x 12	4 x 14



Duplex Concrete Block Hanger Dimensions

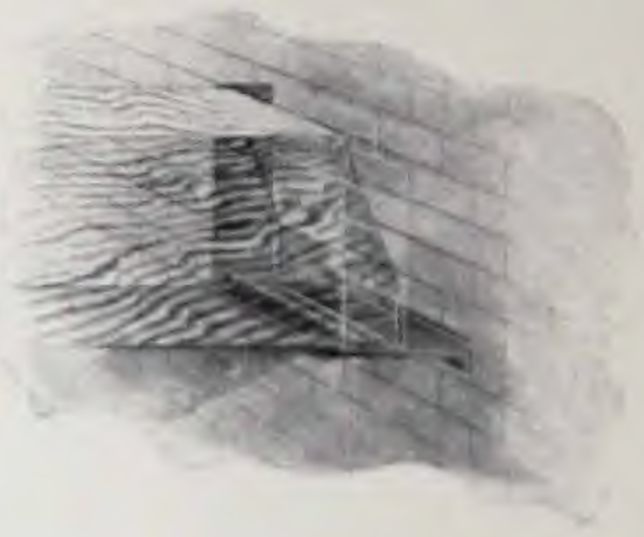
No. of Hanger	A	B	C	D	Bearing on Wall
9	2"	3½"	3½"	2½"	3½x3½"
11	3"	3½"	3½"	2½"	4½x3½"
13	4"	3½"	3½"	2½"	5½x3½"

For Price List see Page 71.

THE DUPLEX WALL PLATE

Made of Malleable Iron, is far superior to any cast iron plate. The rib which extends both up and down gives the very best anchor in the wall.

Carried in stock in all sizes.



DIMENSIONS OF DUPLEX MALLEABLE WALL PLATES

For 6-in. Beams	10-in. x 9-in.
For 8-in. Beams	12-in. x 9-in.
For 10-in. Beams	14-in. x 9-in.
For 12-in. Beams	16-in. x 9-in.
For 14-in. Beams	18-in. x 9-in.
For 16-in. Beams	20-in. x 9-in.
For 18-in. Beams	22-in. x 9-in.

The Duplex Wall Box is designed for anchoring beams in brick walls and for protection against dry-rot. The Wall Box is constructed of a malleable base plate, same as the Duplex Wall Plate above illustrated and of the same dimensions for the respective beams.

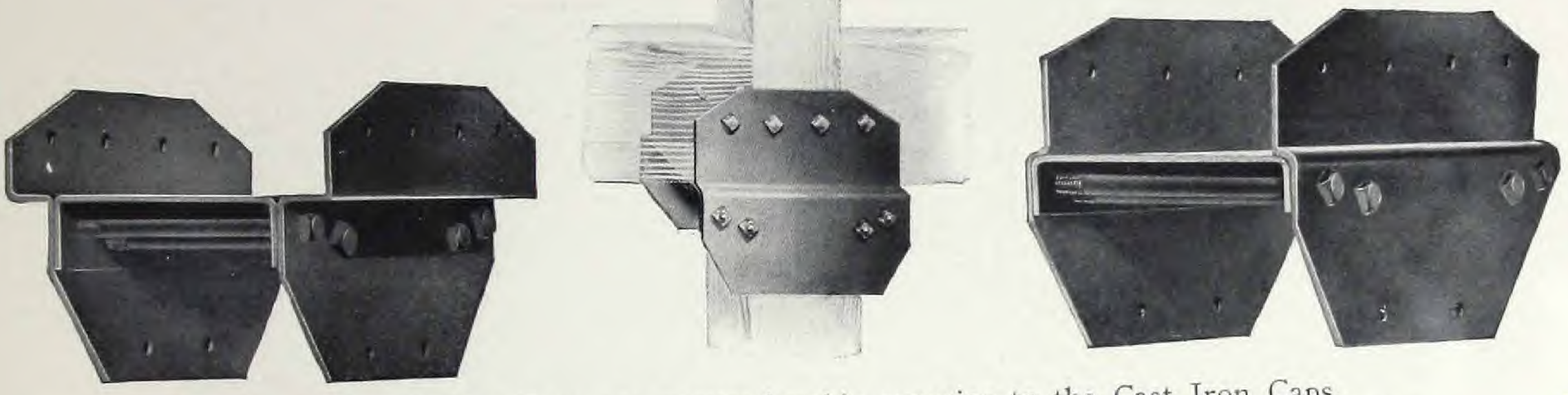
A steel box is riveted to the plate, thereby forming a perfect box for ventilation and for self-release in case of fire. Much stronger than cast iron, easier to handle, no danger of breaking and much lower in price. Furnished with cover plate if desired. Carried in stock in all sizes.

For Price List see Page 69 and Page 70.

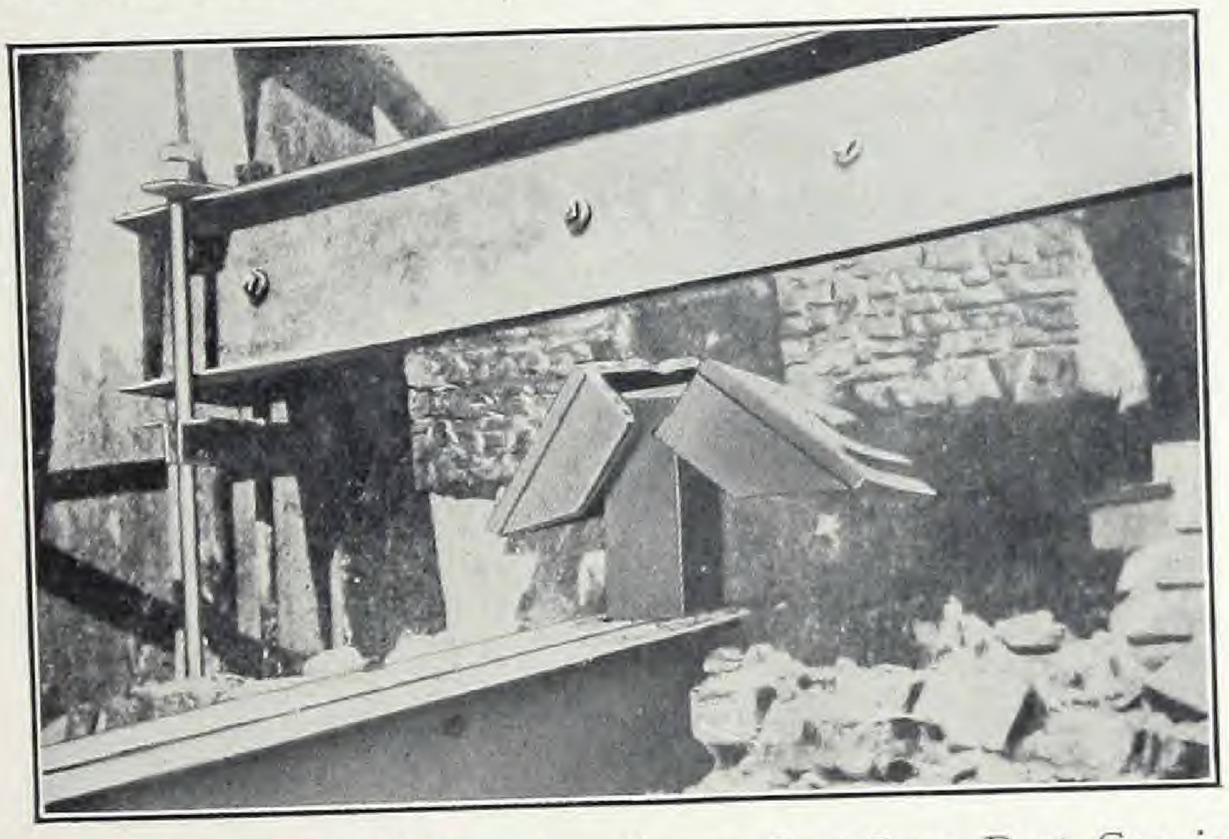
THE DUPLEX HANGER COMPANY

THE DUPLEX POST CAPS

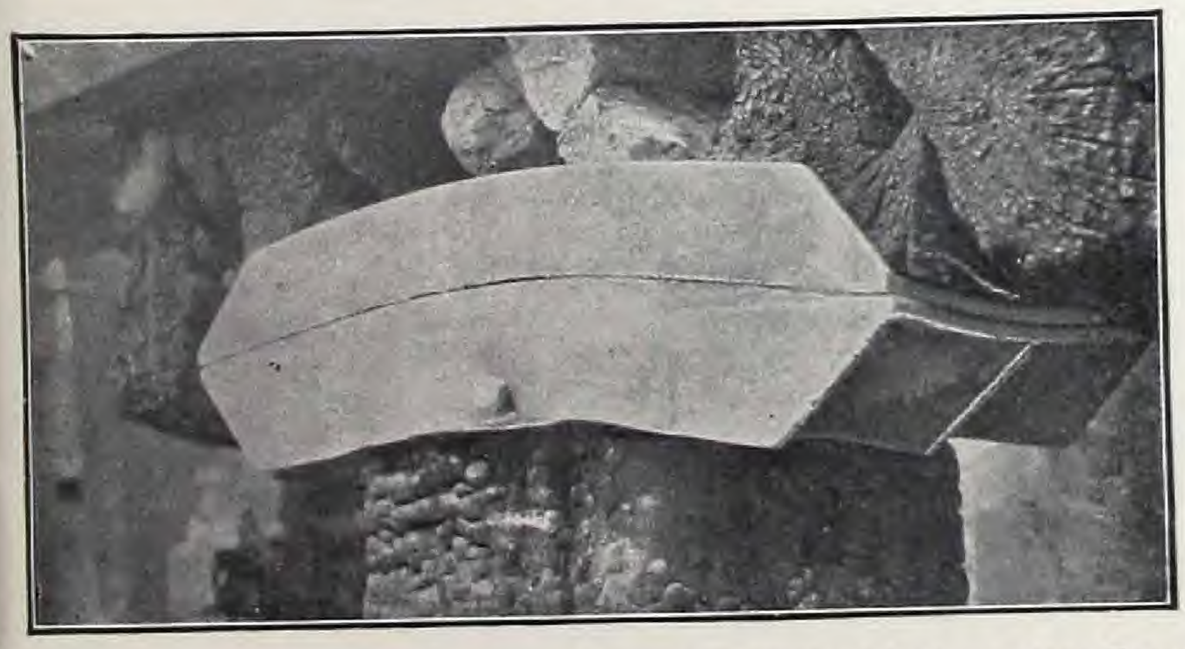
are superior to *CAST IRON CAPS* because they are *BETTER, CHEAPER, MORE CONVENIENT* and *NEATER IN APPEARANCE.*



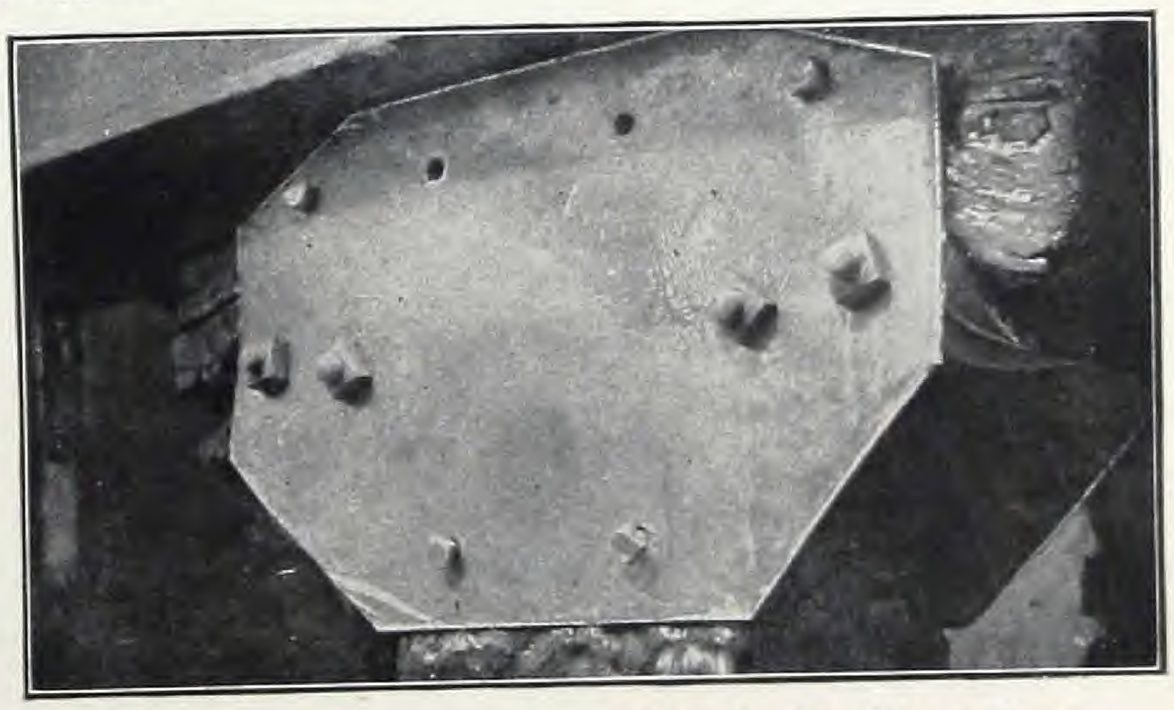
In case of fire Duplex Caps are unquestionably superior to the Cast Iron Caps.
Read report on Fire Test made by the Underwriters' Laboratories in Chicago, Pages 58 and 59.



This photograph shows failure of ordinary Cast Iron Post Cap in fire test.
Standard Form of 10 Inch Gray Iron Post Cap.
This cap was subjected to a load of 31,580 pounds, and a temperature of 1,410 degrees. Failed in 17 minutes. Fire stream of water not applied.



Fire Test on Standard Form of Duplex Malleable Iron Post Caps

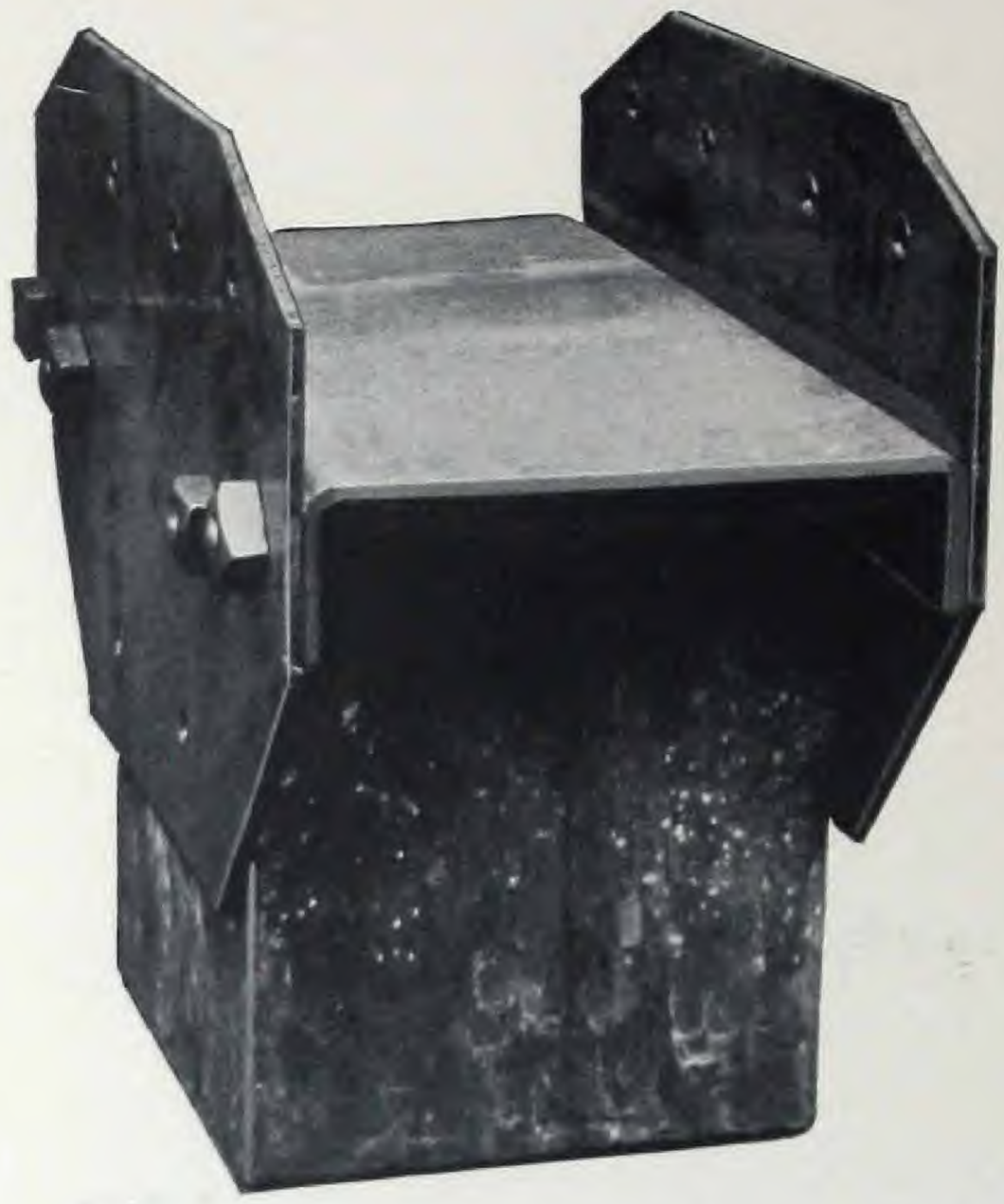


Fire Test on Standard Form of Duplex Steel Post Caps

These photographs show exact conditions of Post Caps after test.
Load applied during test—46,000 pounds; maximum temperature, 1,600 degrees; duration, 24 minutes. Post Cap held load perfectly.

As a result of these tests Duplex Post Caps were ordered, approved, and are now furnished with labels showing inspection of Underwriters' Laboratories under the direction of the National Board of Fire Underwriters.

THE DUPLEX STEEL POST CAP



In this Cap we have the *Most Perfect Column and Girder Connection* that it is possible to obtain.

The Cap is made of mild open hearth steel and consists of three pieces, a bearing bracket and two side pieces, bolted together with four heavy bolts. All engineers who have investigated and used the Cap are unanimous in declaring this to be the best design for rigid construction. The weight of the girder is carried on the shoulder formed on the post. The heavy bolts underneath the bearing bracket relieve the outer edge of the bracket and transmit the load direct to the post. The outer bolt is directly under the plate of the bearing bracket, while the inner bolt is close against the post. This forms a truss of the bolts, plates and bracket. The tests have fully proven the great strength of this design and that it is not possible to break the Cap when even more than six times the ultimate safe load of the timber has been applied.

See tests on pages 58 to 61.

DIRECTIONS FOR USE OF DUPLEX STEEL POST CAP

The two inner bolts are spaced the correct distance apart, so as to form in connection with the side plates a box for the top of the post.

The Cap fits snugly over the post and requires no fitting. Unless specially ordered the Caps are made for dressed timber, ¼ inch less than full size. Full sizes for rough timber without extra charge

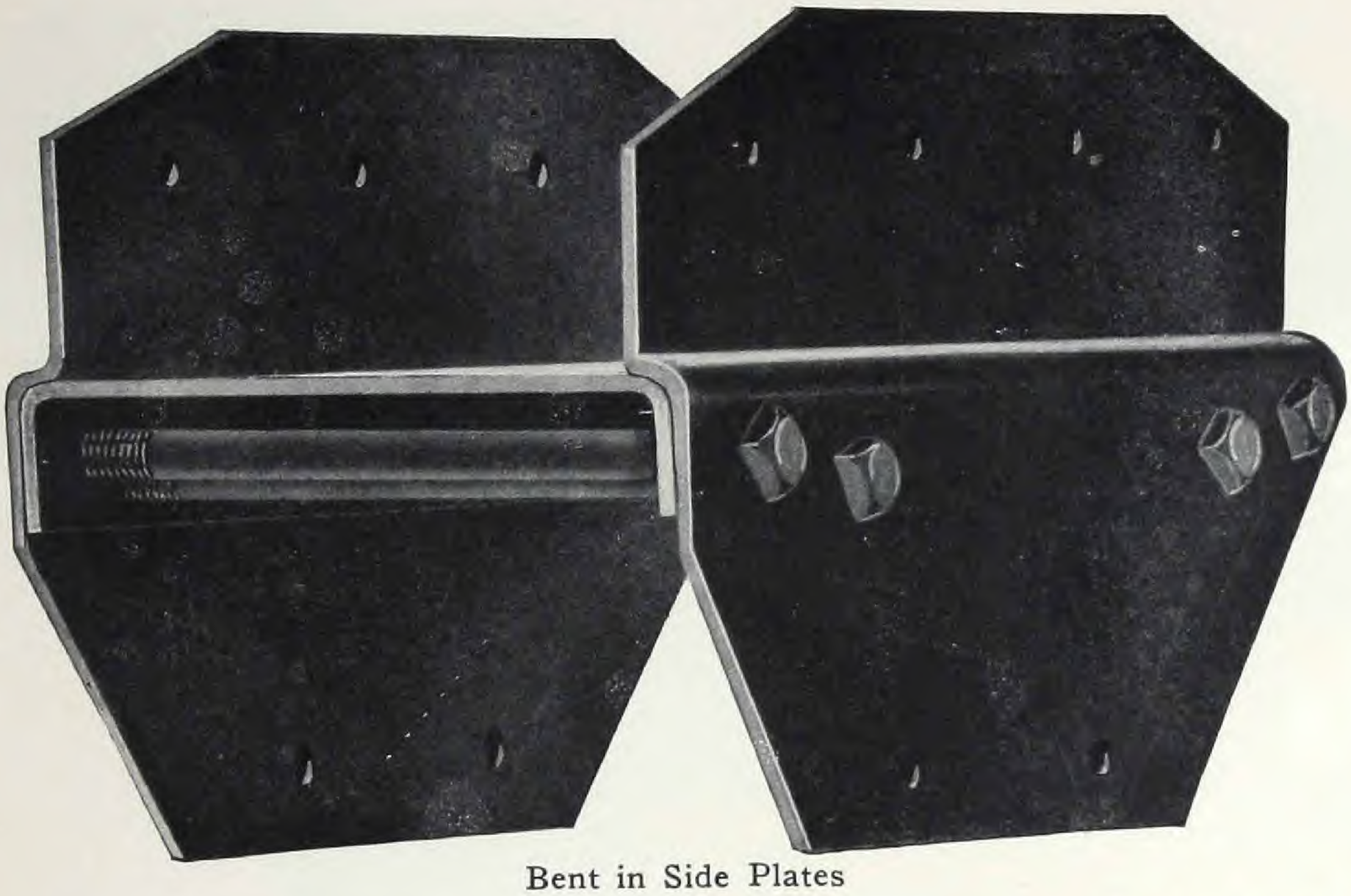
The side plates are punched for lagscrews to attach the girders rigidly.

For 6 x 6 and 8 x 8 Post Caps.....⅜ x 2 Lag Screws
For 10 x 10 and 12 x 12 Post Caps.....½ x 3 Lag Screws
For 14 x 14 and 16 x 16 Post Caps.....½ x 3½ Lag Screws

For Price List see Page 69

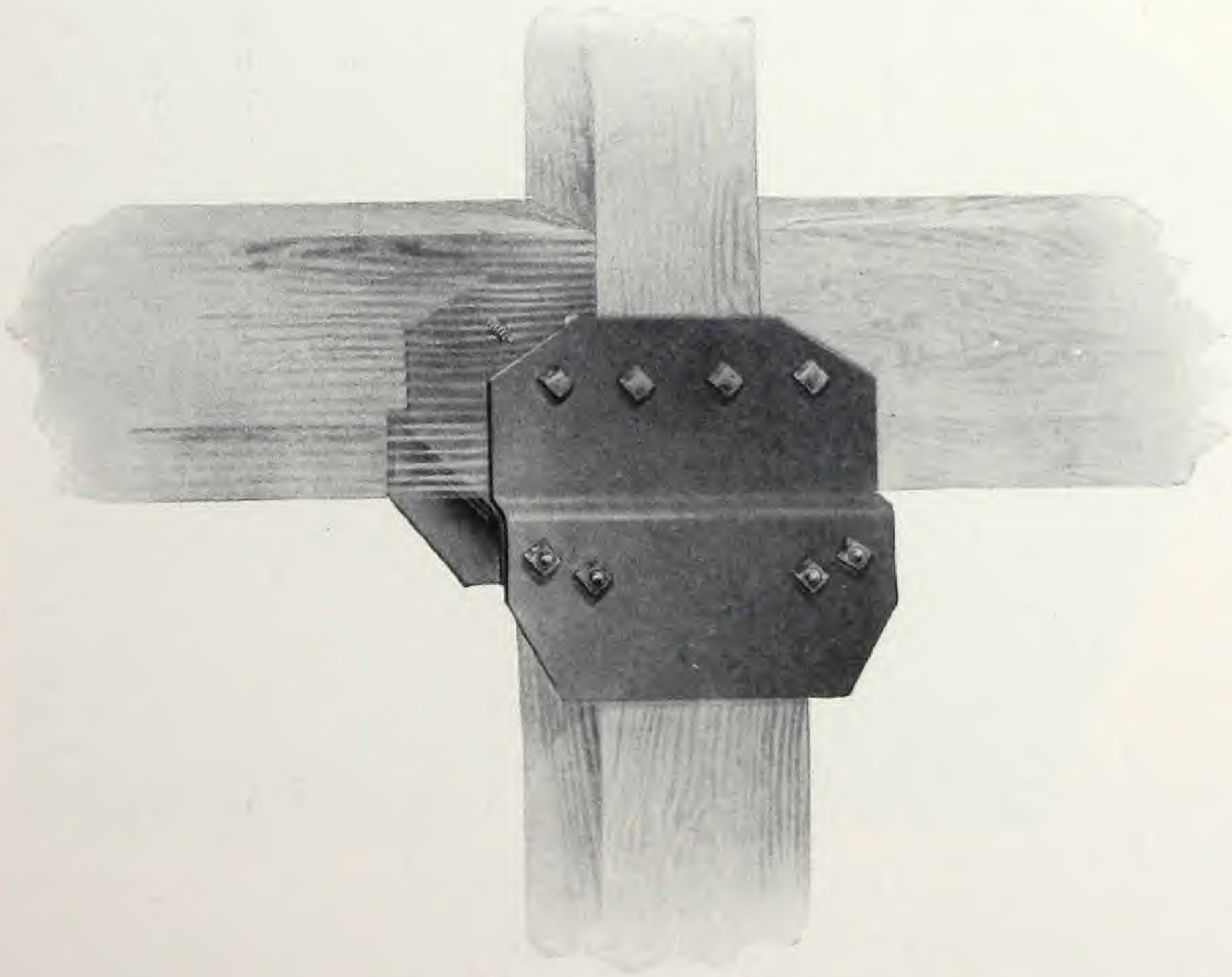
THE DUPLEX STEEL POST CAPS

Bent in Design



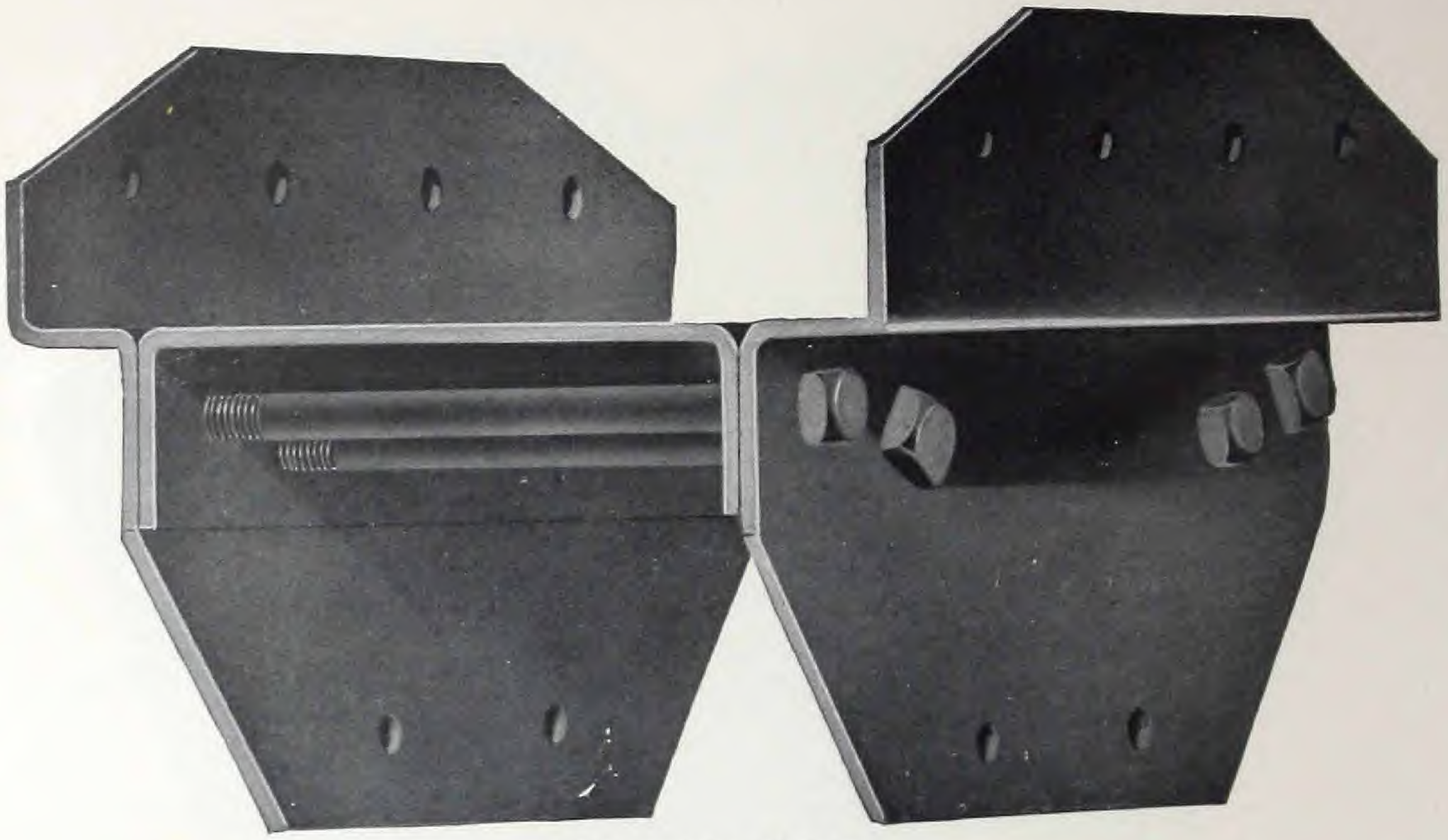
Bent in Side Plates

Illustrating Post Caps in which the upper post and girder are smaller than the lower post When ordering give size post below, size post above and size girders. Made for any framing.



For Price List see Page 69.

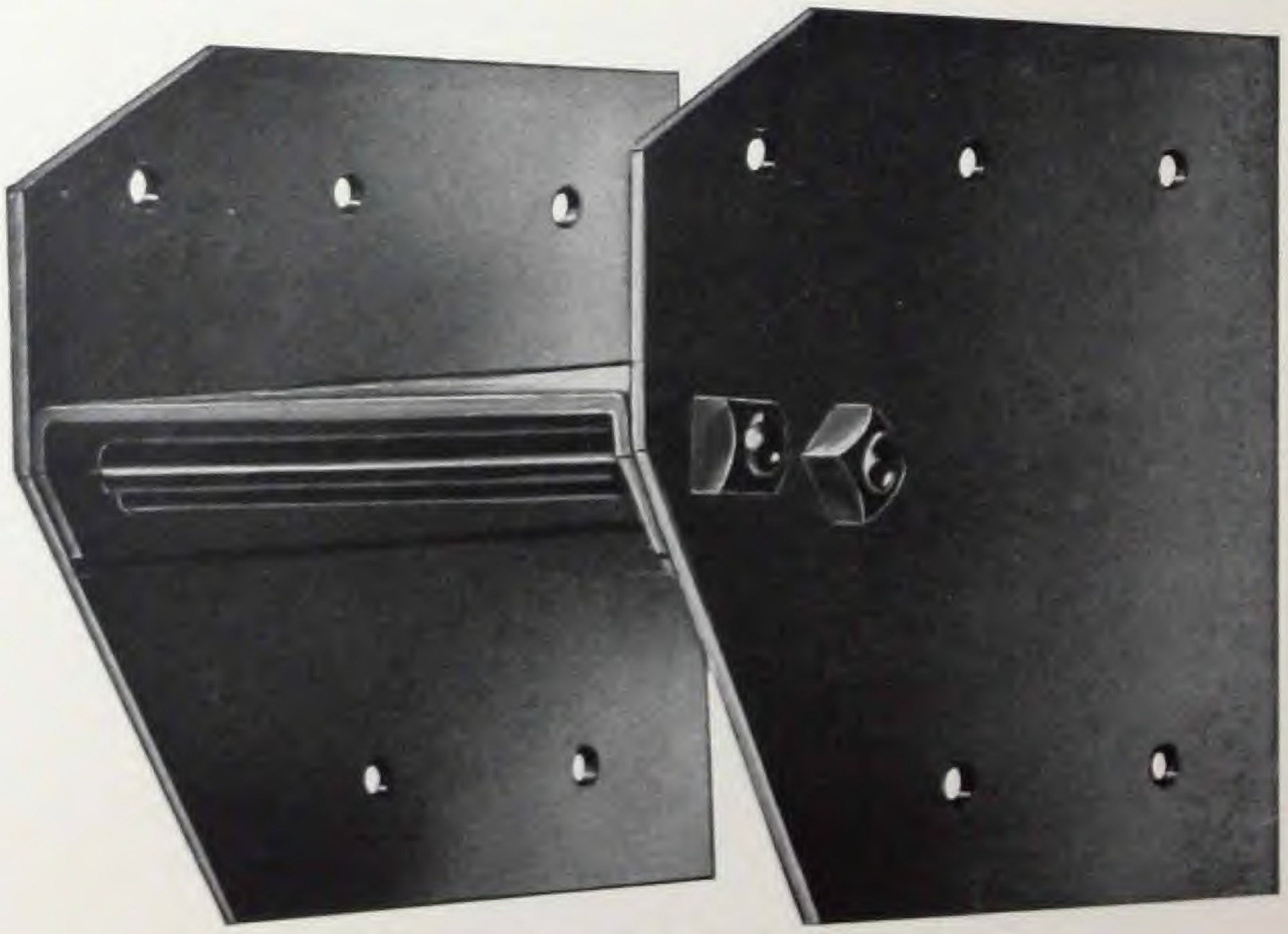
DUPLEX STEEL POST CAP



Offset Side Plates

10 x 10 Post below. Carrying 14-in. Girders.

This Cap is designed to carry a larger girder than post below. We manufacture this Cap in any desired size.



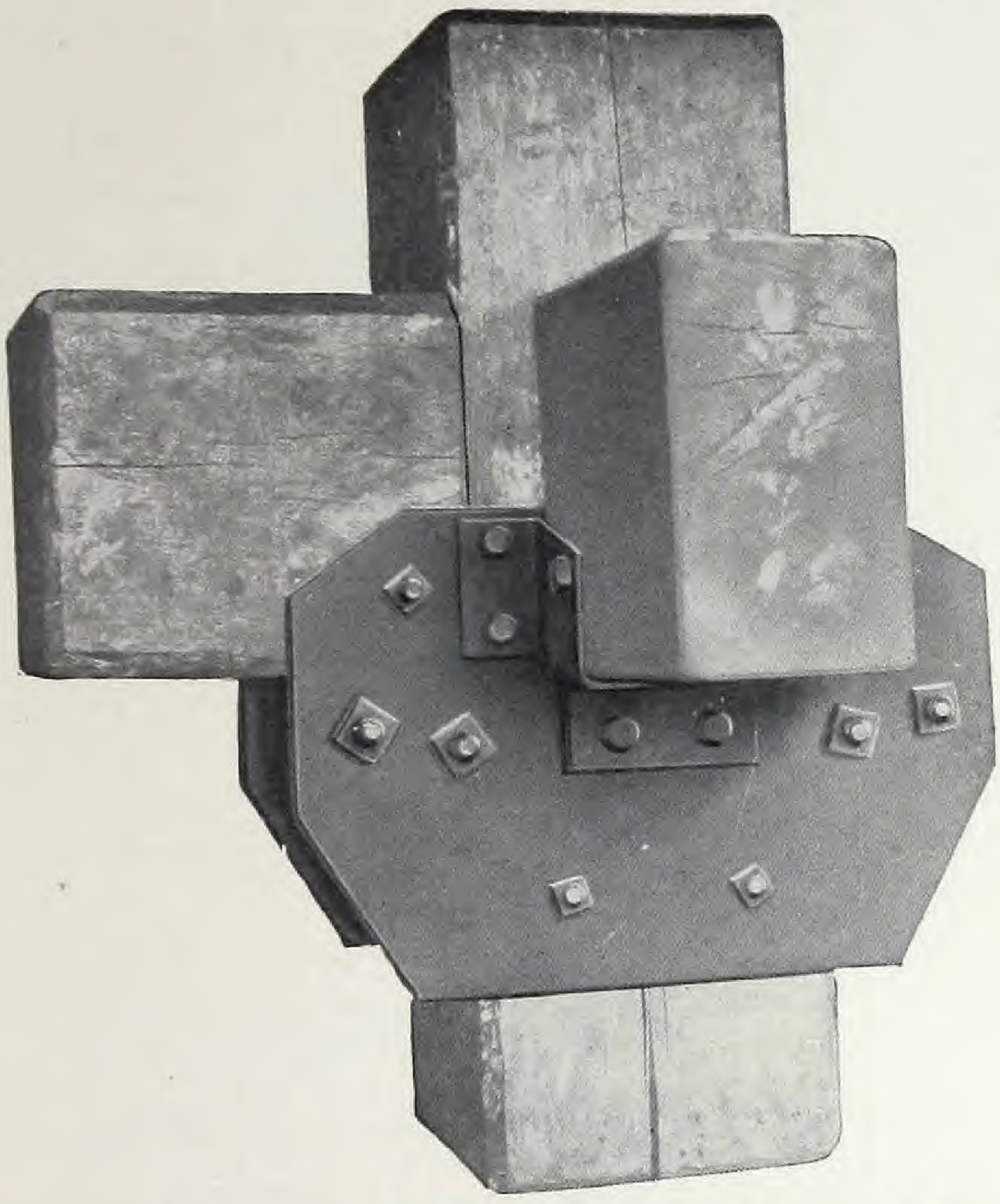
One Way Duplex Steel Post Cap

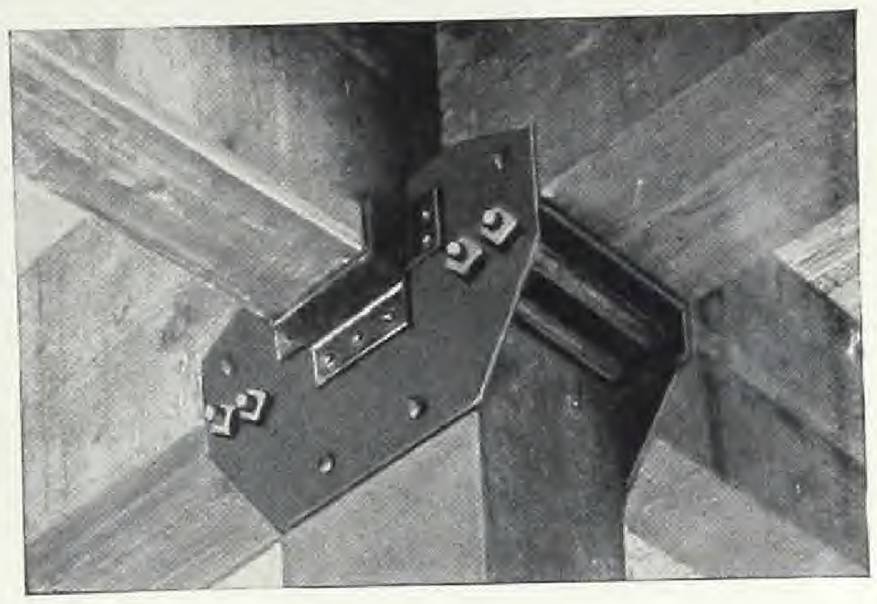
This design is frequently called for in construction of elevator shafts or where posts are placed against wall.

For Price List see Page 69.

THE DUPLEX STEEL POST CAP

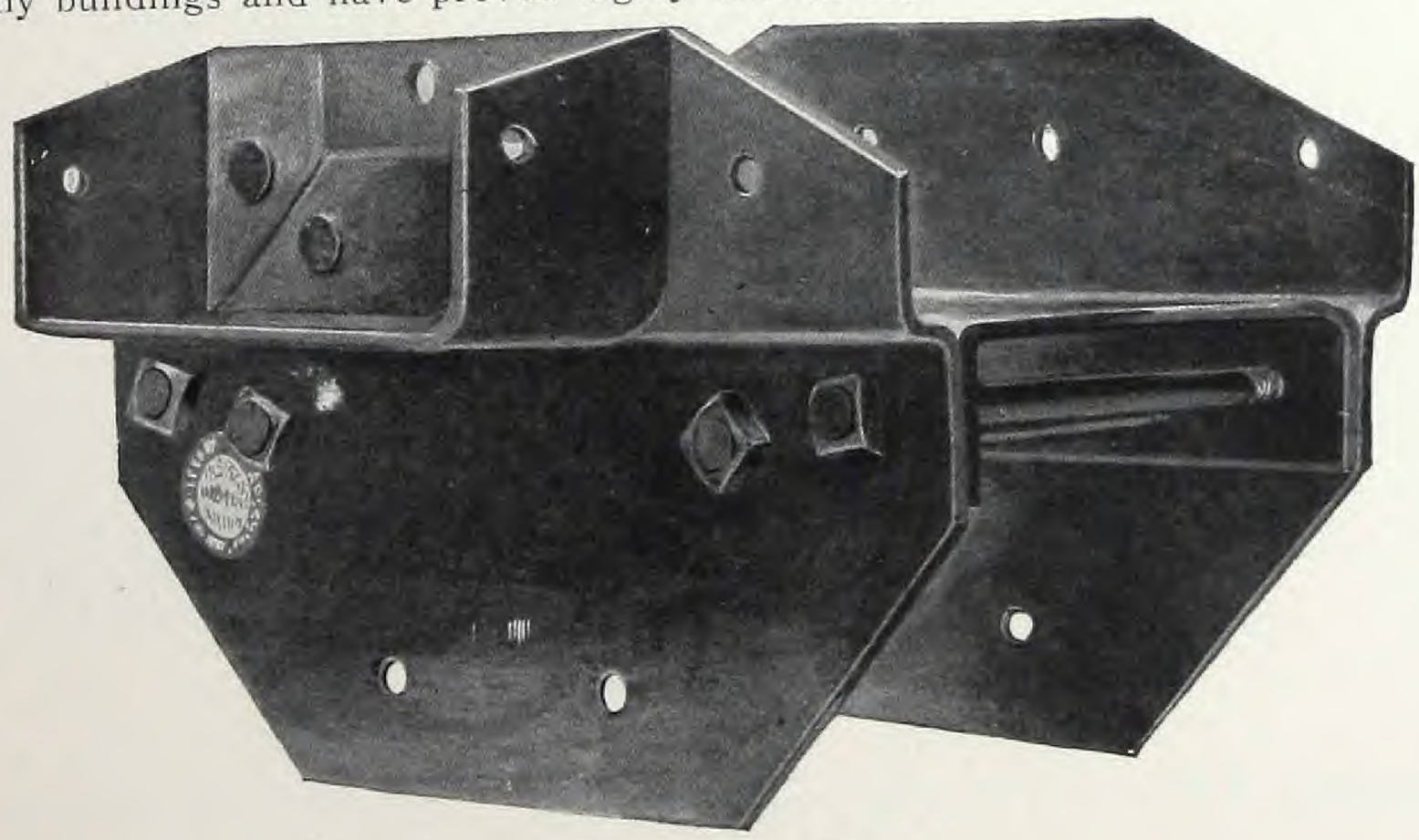
For Four-way Construction





The post cap rests directly on top of the lower post. Illustration shows bolts are outside of post, no framing necessary.

We illustrate herewith common forms of four-way construction. These are in use in a great many buildings and have proven highly satisfactory.



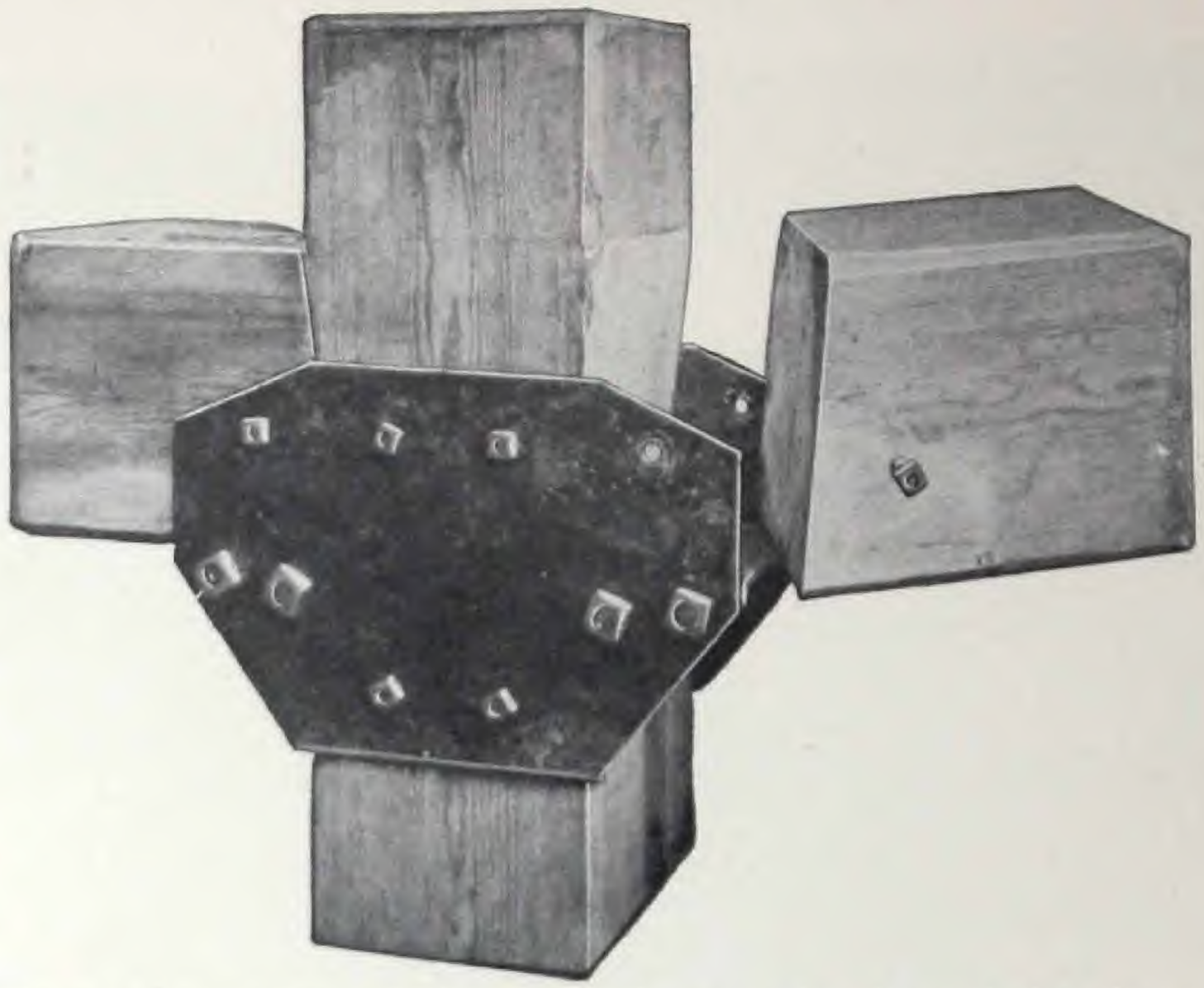
Bent in Angles

On account of its simple construction the Duplex Steel Post Cap lends itself very readily to any desired form. We have been able to meet every design asked for and have constructed the Caps for bevel roofs, right angles, bifurcated, and many other special conditions. We carry a large assortment of plates in stock and can fill orders promptly.

For Price List see Page 69.

THE DUPLEX STEEL POST CAP

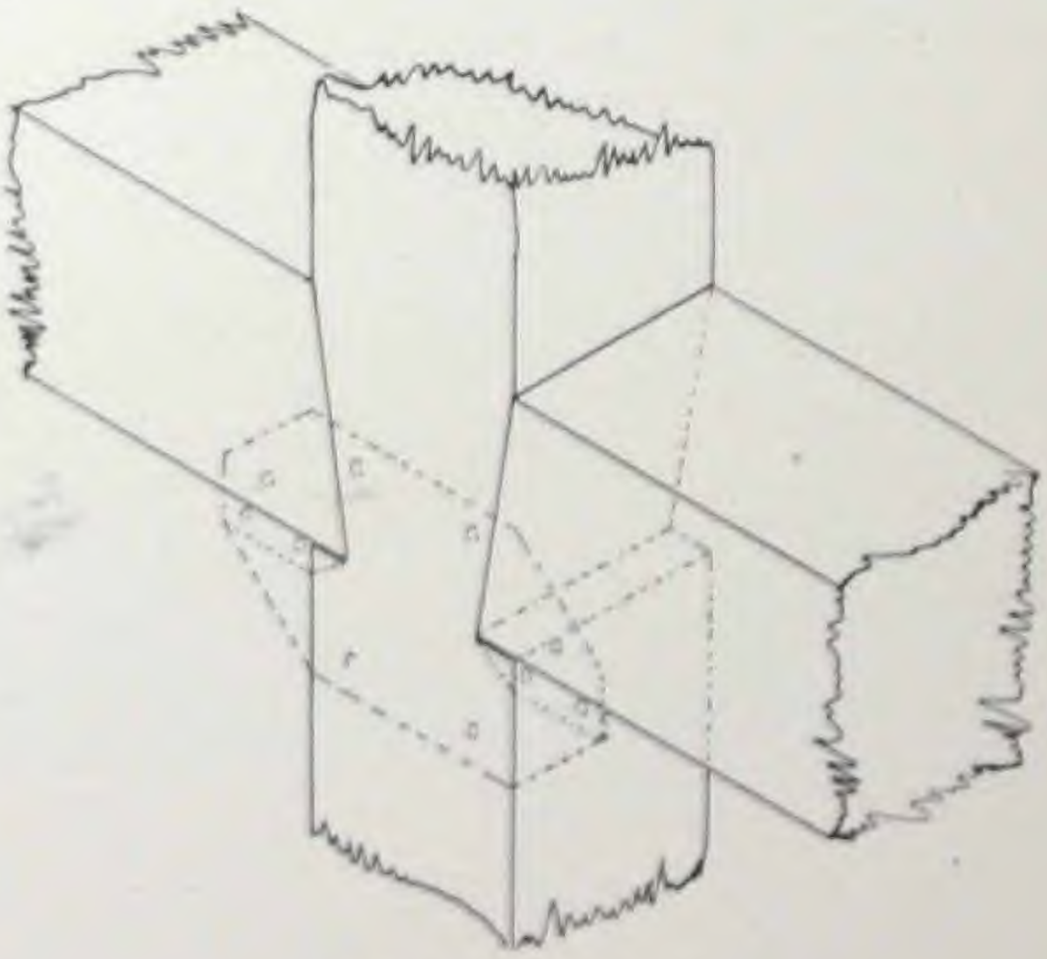
For Use on Continuous Posts



Frequently occasions arise, which compel the use of a Cap of this design. The Cap is particularly adapted for construction of Mezzanine Floors, Saw-tooth Roof Construction, etc.

As shown on illustration, the post is notched, so as to provide a shoulder for the bearing bracket.

The Cap is of the same general design as our regular Steel Post Cap, with the exception: The bearing bracket instead of running clear through the full length of the Cap is omitted, and two short brackets are used, each having approximately one inch bearing on the shoulder of the post. The heavy bolts underneath the bearing brackets secure a rigid bearing for the girder.



Continuous Column
WITH
Duplex Post Cap

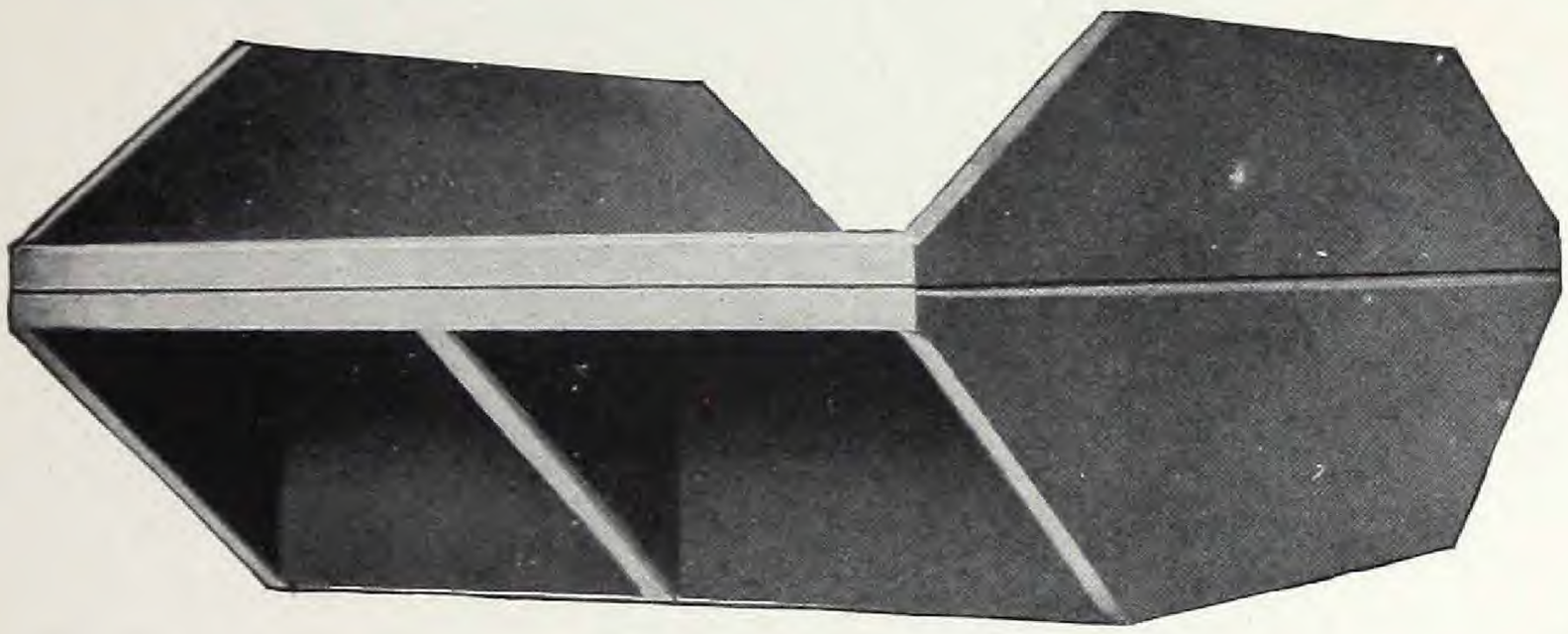
Price same as Duplex Steel Post Caps.

For Price List see Page 69.

THE DUPLEX MALLEABLE IRON POST CAP

The great advantages of malleable iron over cast iron are so thoroughly appreciated by competent engineers and architects that the new cap illustrated herewith, is now given preference to cast iron caps. We make the cap in two pieces so as to be able to fit every possible size in construction.

The lower part of the post cap is made so as to form a complete cap for the post, and when the upper channel is riveted on same, the ideal method of construction is had. By the use of lag-screws for the girders and posts, a rigid connection is formed.



Duplex Malleable Iron Post Cap No. 1

If the girders that are to be used are wider than the post on which they rest, then the upper channel will be furnished wide enough to fit the girder. Should the lower post be wider than the girders which it carries, a smaller channel can be furnished. This will insure a neat appearing and close fitting post cap.

In case of fire, a malleable iron cap will not break off like a cast iron cap when cold water comes in contact with the heated cast iron, nor can a malleable iron cap be broken if subjected to a heavy jar. We are ready to furnish special designs if required.

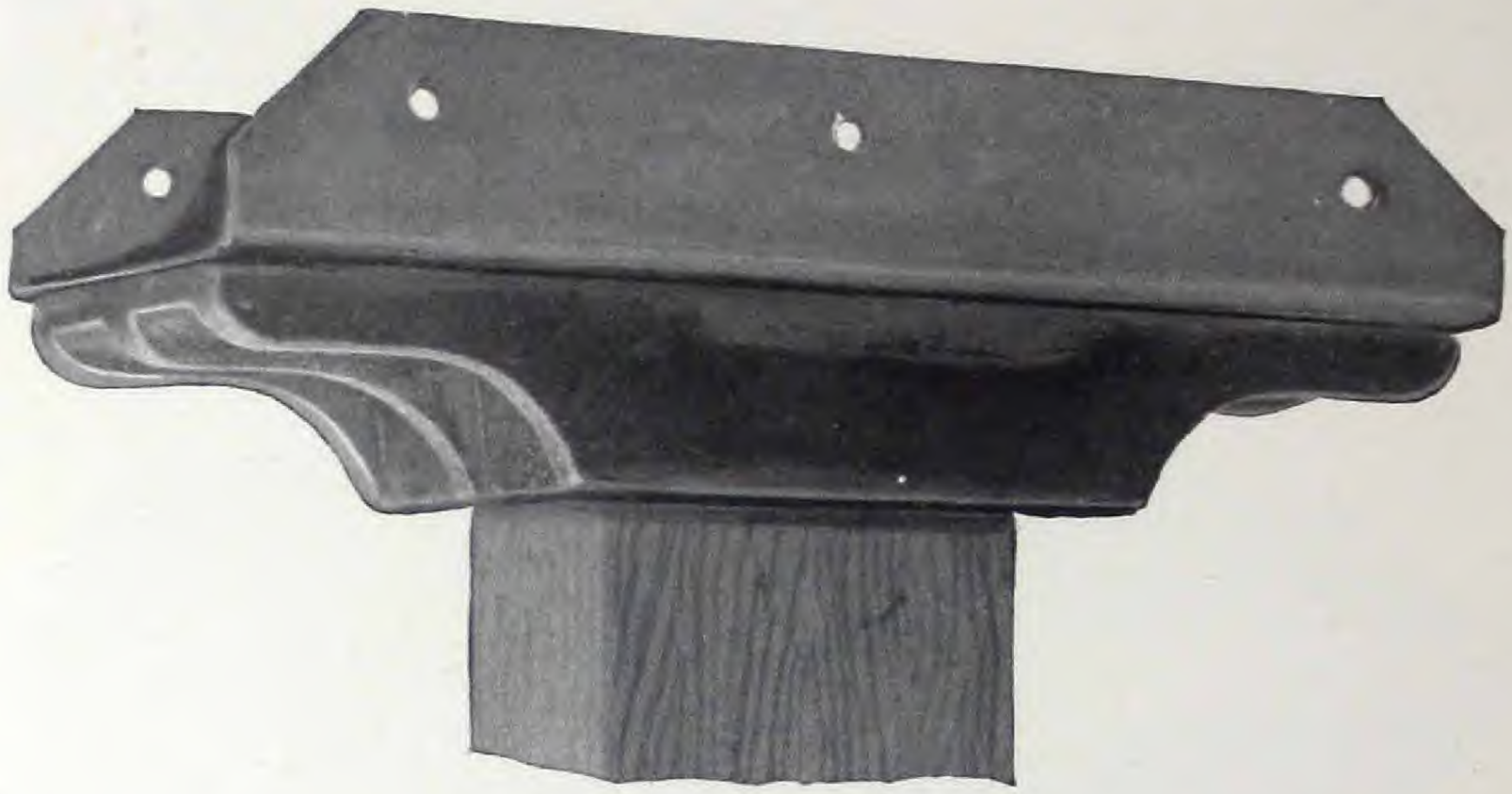
Duplex Malleable Iron Post Cap No. 2

The post cap here shown is a malleable iron cap to give architects an opportunity to use a very common form of construction at a lower price than a cast iron cap can be bought at. These caps fulfill all the requirements of strength for ordinary construction, and at the same time make it permissible to use either a wider or smaller girder than the post. The girders should be tied together longitudinally by iron straps, spiked or fastened with lagscrews, to their sides. The girders are anchored to the cap by lagscrews.

See report of tests, 58 to 61.

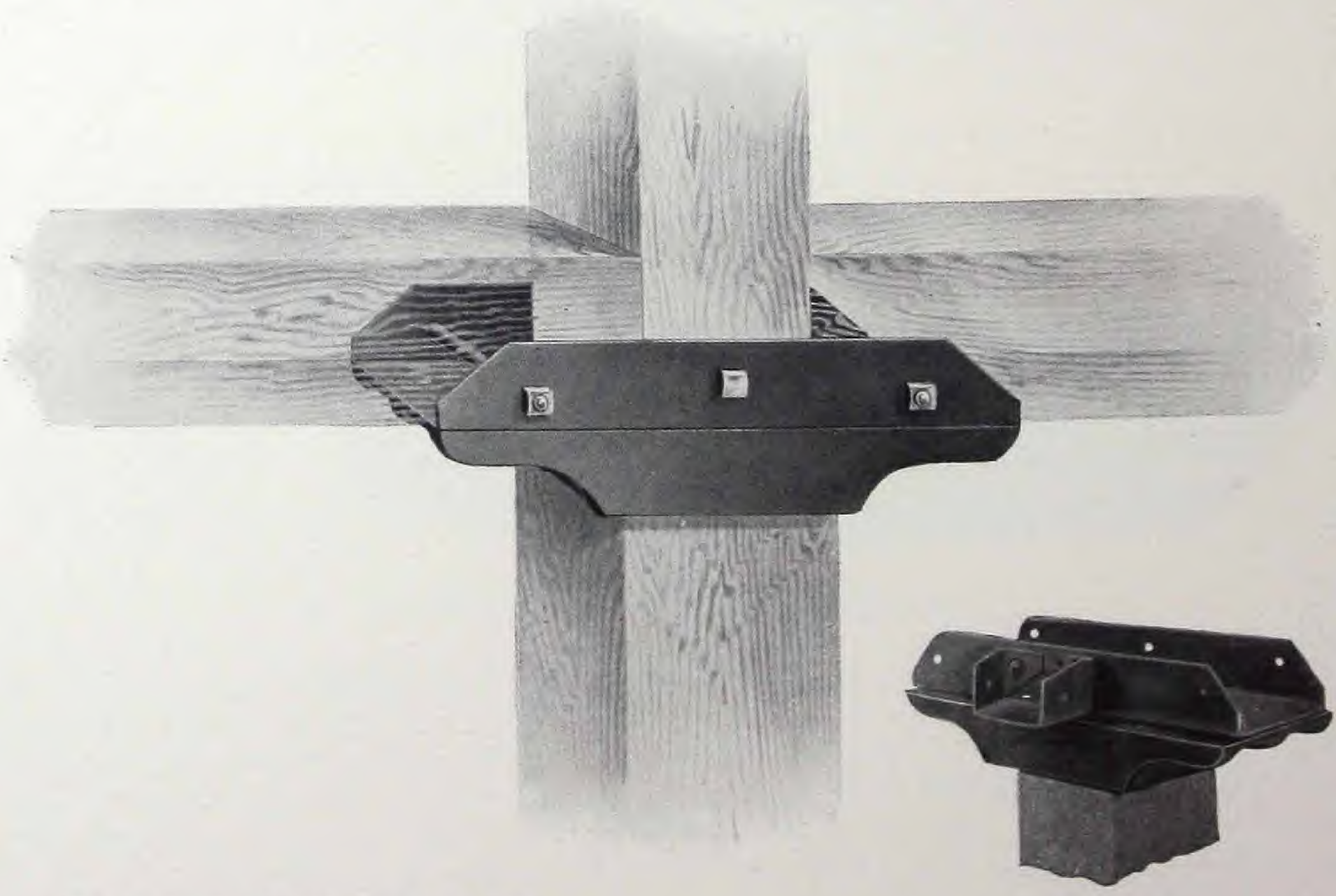
For Price List see Page 70.

THE DUPLEX MALLEABLE IRON AND STEEL COMBINATION CAP



We have had frequent requests to design a Cap for buildings where it was necessary to finish the ceilings and where a Cap was needed, which allowed the ceiling to be finished close up to the post. The Cap here illustrated completely answers this purpose. It is very neat in appearance, and especially adapted for mercantile buildings, apartment houses, etc.

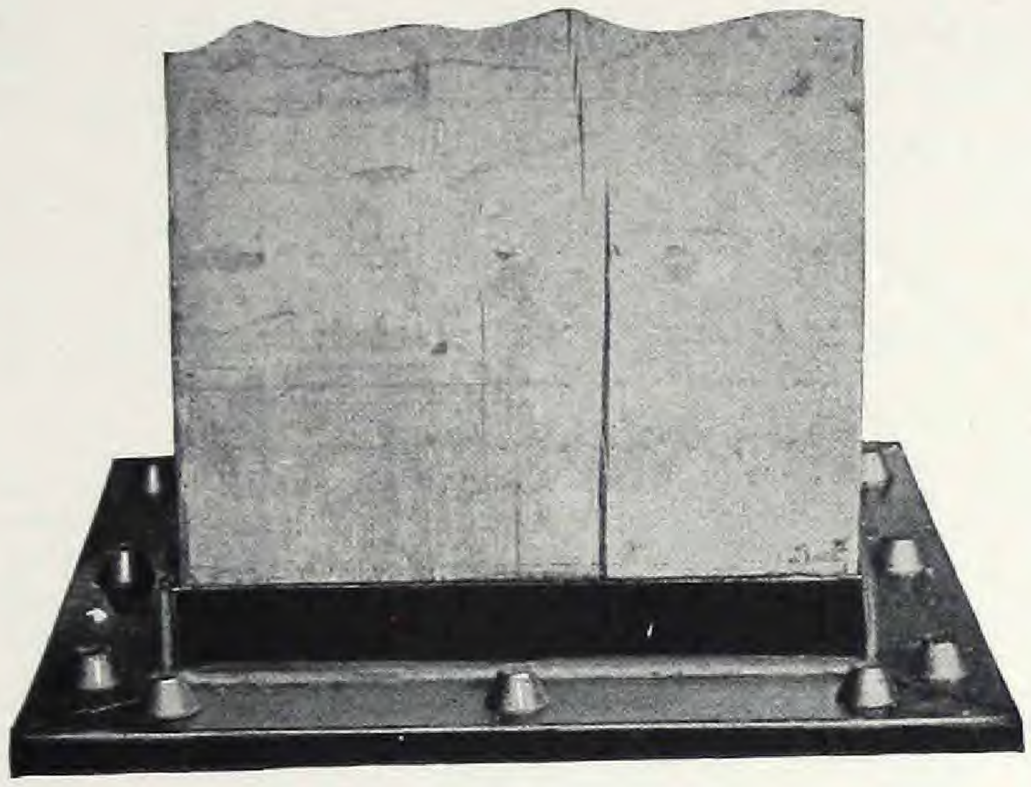
The lower part of the Cap is made of Malleable Iron while the upper channel is Open Hearth Steel.



For report of test, see page 62.

For Price List see Page 70.

THE DUPLEX STEEL POST BASE



Is made of steel plates and angles riveted together to fit the post and is much more economical than the old style cast iron bases.

We carry the following sizes in stock:

6 x 6	Post.	Dimensions	over	all	12 x 12
8 x 8	"	"	"	"	14 x 14
10 x 10	"	"	"	"	16 x 16
12 x 12	"	"	"	"	18 x 18
14 x 14	"	"	"	"	20 x 20
16 x 16	"	"	"	"	24 x 24
18 x 18	"	"	"	"	27 x 27
20 x 20	"	"	"	"	30 x 30

Larger sizes made up on short notice. We are also prepared to furnish any of the above sizes with larger bearing if desired.

For Price List see Page 69.

ULTIMATE SAFE LOADS

in pounds uniformly distributed, for long leaf Yellow Pine Timbers supported at both ends

The Duplex Hangers and Post Caps are designed to carry safely the timbers for which they are listed, with a large factor of safety.

$$W = \frac{P\,B\,D^2}{9\,L}$$

W = Safe load uniformly distributed in lbs. P = Extreme Fibre Stress = 1,250 lbs per square inch for long leaf Yellow Pine. B = Breadth in inches. D = Depth in inches. L = Distance between support in feet.

The Modulus of Rupture adopted being 5,000 lbs. for long leaf Yellow Pine.

For Span of	10 feet	12 feet	14 feet	16 feet	18 feet	20 feet	22 feet	24 feet
2 x 6″	1000	833	700	632	566	500	466	432
2 x 8″	1766	1466	1266	1100	966	900	800	733
2 x 10″	2766	2300	1966	1733	1532	1400	1266	1166
2 x 12″	4000	3333	2866	2500	2232	2000	1800	1666
2 x 14″	5432	4532	3900	3100	3032	2732	2466	2266
2 x 16″	7100	5932	5100	4432	3952	3566	3232	2966
3 x 6″	1500	1250	1050	950	850	750	700	650
3 x 8″	2650	2200	1900	1650	1450	1350	1200	1100
3 x 10″	4150	3450	2950	2600	2300	2100	1900	1750
3 x 12″	6000	5000	4300	3750	3350	3000	2700	2500
3 x 14″	8150	6800	5850	5100	4550	4100	3700	3400
3 x 16″	10650	8900	7650	6650	5928	5350	4850	4450
4 x 6″	2000	1666	1400	1266	1134	1000	934	866
4 x 8″	3534	2934	2534	2200	1934	1800	1600	1466
4 x 10″	5543	4600	3934	3466	3066	2800	2534	2334
4 x 12″	8000	6666	5733	5000	4466	4000	3600	3333
4 x 14″	10866	10066	7800	6800	6066	5466	4934	4534
4 x 16″	14200	11866	10200	8866	7904	7134	6466	5934
5 x 10″	6916	5750	4916	4332	3832	3500	3166	2916
5 x 12″	10000	8332	7166	6250	5582	5000	4500	4165
5 x 14″	13582	11332	9750	8500	7582	6830	6166	5666
5 x 16″	17750	15830	12750	11082	9880	8916	8084	7416
6 x 8″	5300	4400	3800	3300	2900	2700	2400	2200
6 x 10″	8300	6900	5900	5200	4600	4200	3800	3500
6 x 12″	12000	10000	8600	7500	6700	6000	5400	5000
6 x 14″	16300	13600	11700	10200	9100	8200	7400	6800
6 x 16″	21300	17800	15300	13300	11900	10700	9700	8900
8 x 8″	7066	5866	5066	4400	3866	3600	3200	2934
8 x 10″	11064	9200	7866	6934	6134	5600	5066	4666
8 x 12″	16000	13333	11466	10000	8934	8000	7200	6664
8 x 14″	21728	18134	15600	13600	12134	10934	9866	9066
8 x 16″	28400	23734	20400	17728	15808	14266	12926	11866
10 x 10″	13834	11500	9834	8666	7666	7000	6334	5834
10 x 12″	20000	16660	14334	12500	11166	10000	9000	8332
10 x 14″	27166	22666	19500	17000	15166	13666	12334	11334
10 x 16″	35500	29666	25500	22166	19760	17834	16166	14834
12 x 12″	24000	20000	17200	15000	13400	12000	10800	10000
12 x 14″	32600	27200	23400	20400	18200	16400	14800	13600
12 x 16″	42600	35600	30600	26600	23800	21400	19400	17800
12 x 18″	54000	45000	38550	33750	30000	27000	24550	22500
14 x 14″	38034	31734	27300	23800	21224	19124	17266	15866
14 x 16″	49700	41524	35700	31024	27664	24966	22624	20766
14 x 18″	63000	52500	45000	39350	35000	31500	28600	26250
16 x 18″	72000	60000	51400	45000	40000	36000	32700	30000

For White or Norway Pine, the safe loads are about two-thirds of above *tables*.

In order to obtain the uniformly distributed load for stiffness, for long leaf Yellow Pine beams with a deflection not exceeding one-thirtieth of an inch per foot of span, the formula used is:

$$\text{Safe load in pounds} = \frac{8\ b\ d^3\ E}{5\ L^2}$$

b = breadth in inches; d = depth in inches; E = constant allowing a deflection of one-thirtieth of an inch per foot of span for long leaf Yellow Pine = 137; L = span in feet.

Beams supported at both ends.

Yellow Pine Posts

Safe loads in tons of 2000 pounds on square yellow pine posts with square bearings and symmetrically loaded. Fibre stress 1000 pounds per square inch.

Hgt. in Ft.	SIZE OF POST Note.—Rough sizes are in full inches. For example: 4 x 4 rough dressed to 3½ x 3½								
	3½x3½	5½x5½	7½x7½	9½x9½	11½x11½	13½x13½	15½x15½	17½x17½	19½x19½
6	4.32	12.69	25.35	42.19	62.96	88.96	116.88	149.83	186.89
8	3.65	11.50	23.76	40.29	61.02	85.75	114.57	147.45	184.37
10	3.11	10.34	22.11	38.29	58.70	83.06	111.95	144.74	181.57
12	2.68	9.29	20.48	36.21	56.24	80.57	108.89	141.53	178.34
14		8.39	18.95	34.06	53.68	77.66	105.80	138.04	174.53
16		7.56	17.52	32.08	51.13	74.63	102.37	134.59	170.73
18		6.89	16.74	30.19	50.26	71.62	98.83	130.76	166.45
20		6.29	15.06	28.32	46.20	68.29	95.49	126.83	162.37
22			14.00	26.68	44.00	65.88	92.23	122.88	158.18
24			13.06	25.15	41.80	63.05	88.95	119.25	154.00
26				23.74	39.74	60.37	85.59	115.34	149.44
28				22.41	37.80	57.61	82.31	111.51	145.26
30				21.16	36.00	55.45	81.32	107.80	141.17

Points that should be considered in selecting or designing

Joist and Wall Hangers

By F. E. KIDDER, F. A. I. A.

This paper was read by Mr. F. E. Kidder at a special meeting of the Colorado Chapter of the A. I. A., February 27th, 1903, and contains much that is of interest and practical value concerning joist and wall hangers. This subject is an important branch of building and should not be slighted for other details. Mr. Kidder is universally acknowledged as an authority on Building Construction, and his works are found in every architect's office in the country. We print this paper with the kind permission of the author. The cuts are reproduced by courtesy of the American Architect and Building News, in whose pages this article first appeared.

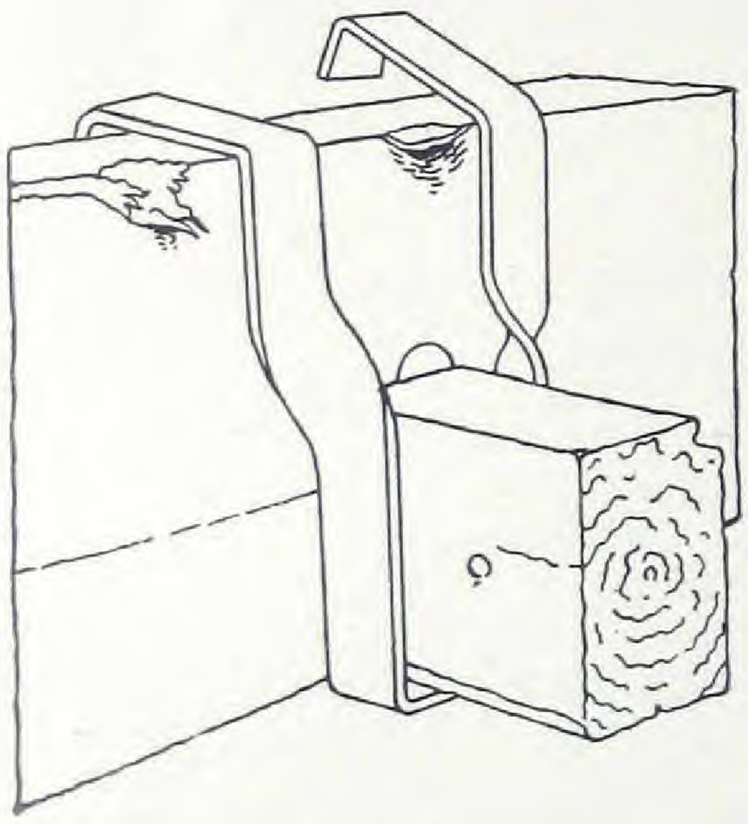


Fig. 1.

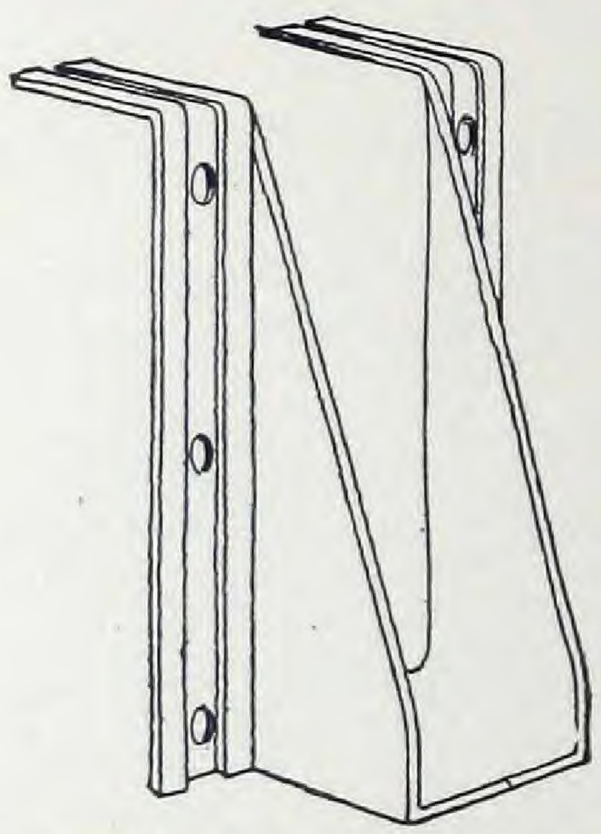


Fig. 2. The Van Dorn Hanger.

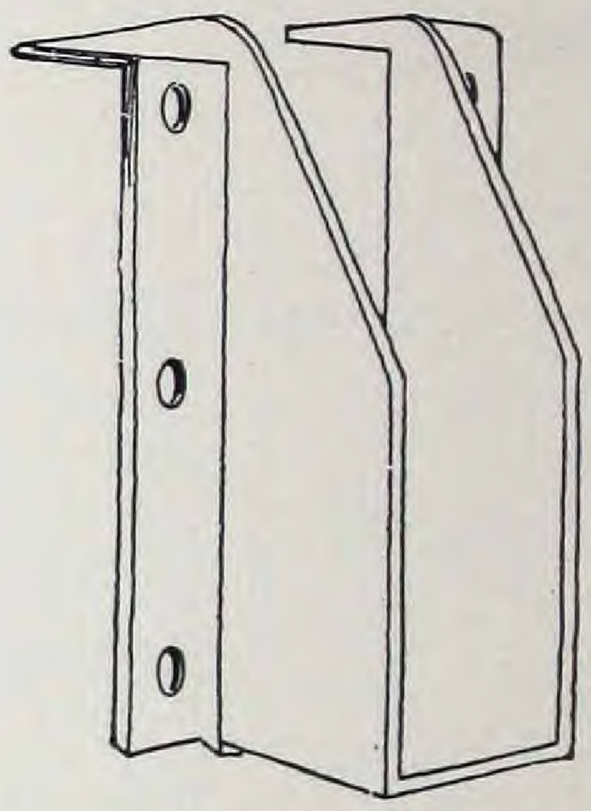


Fig. 3. The National Hanger.

Although wrought-iron and steel stirrups have for a long time been used for the support of floor-beams, headers and girders in buildings, no complete tests to determine their carrying-capacity appear to have been made until about three years ago, when a series of tests on a common stirrup, a Van Dorn hanger, and a Duplex hanger were made at the Massachusetts Institute of Technology. Since that time other comparative tests have been made, and last November a very serious accident occurred in a large warehouse in Minneapolis, due to the failure of a steel wall-hanger of the stirrup type. This accident and the tests above mentioned have led the writer to prepare this paper, with the view of calling attention to the danger of overlooking the tendency to fail by bending, and crushing of the wood, in the case of hangers of the stirrup type, and, incidentally, to the comparative advantages and disadvantages of different hangers.

Before proceeding farther it will probably be well to describe the various styles of hangers now on the market.

The oldest, and, in this section, the most common style of hangers is the common stirrup, forged by hand from bar iron or steel.

The common shape of this hanger is shown by Figure 1. Wherever the beams to be supported come directly opposite each other, it is the common practice to use a double stirrup, formed by welding together two single stirrups.

Within the past ten or twelve years, several patented forms of stirrup have been placed on the market by different manufacturers. The first of these in the point of time, I believe to be the Van Dorn steel hanger, shown by Figure 2. Following this came the National, Cleveland and Lane hangers (shown in Figures 3, 4 and 5), and possibly others. All of the above, as you will see, are of the stirrup type, but are bent and forged by machinery instead of by hand, the material used being a high grade of mild steel.

As a rule, they are neater in appearance than the ordinary stirrup, and are in many ways preferable to it, provided they are not made too light. With the single exception of the Cleveland hanger, none of these forms are made to turn down over the back of the carrying-beam, but are simply secured to the top and side of the beam by spikes.

Besides these, there are the Goetz, Rieseck and Duplex hangers (Figures 6, 7, 8 and

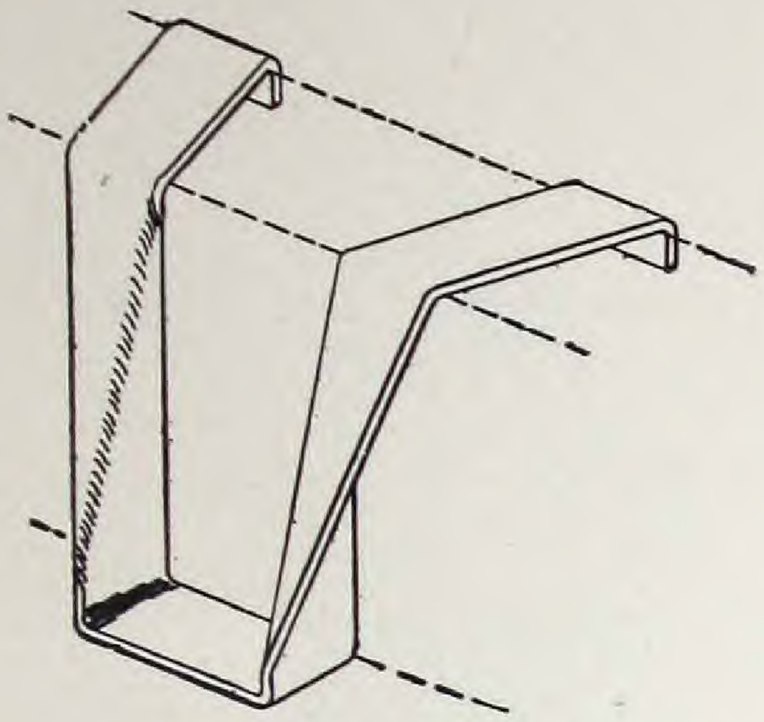


Fig. 4. The Cleveland Hanger.

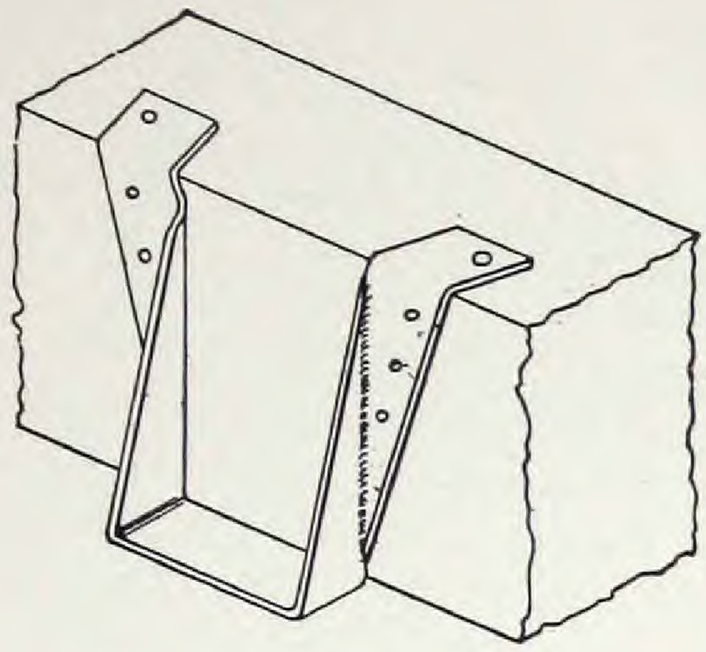


Fig. 5. The Lane Hanger.

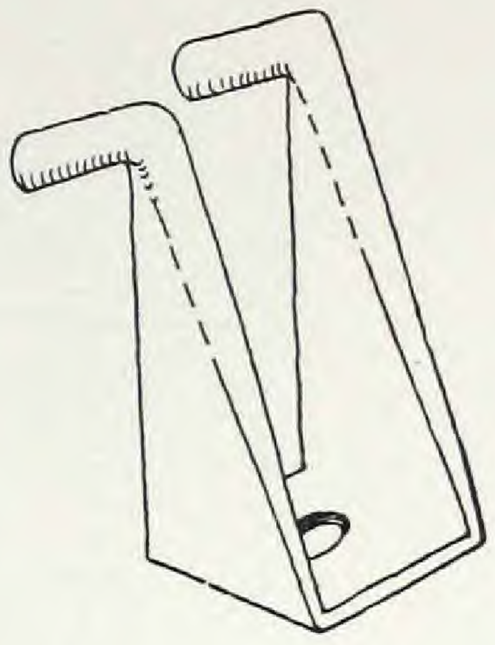


Fig. 6. The Goetz Hanger.

9), the first two being, in effect, a short stirrup, but made to let into holes bored in the side of the beam just above the neutral axis, while the last differs from all other joist-hangers, in that it is made of annealed cast-iron, and in an entirely different shape. These three styles of hangers possess, in common, two advantages over all hangers of the stirrup type, in that the settlement of the floor and ceiling from the shrinkage of the carrying-beam is only about one-half what it is where the stirrup is supported from the top of the beam, and also that they offer no obstruction to the flooring.

The matter of shrinkage is an important consideration where the ceiling is to be plastered and decorated.

When used in pairs, all the patent stirrups are connected by riveting their top flanges to a steel plate.

The Van Dorn, National, Cleveland and Lane hangers, when used singly over steel beams, are bent around the top flange of the beam.

The Van Dorn and National hangers are made into wall-hangers by riveting the top flanges to a steel plate, usually turned up at the back, so as to tie into the wall. The arms of the Lane and Cleveland wall-hangers are made long enough to build into the wall 8 inches and turn up at the back. The Rieseck wall-hanger is made to lie on a specially forged steel plate with the wall-end of the arms bent down into the brick-work. The Duplex wall-hangers, while made on the same principle as the joist-hangers, are of quite a different shape, three styles of the Duplex wall-hangers being shown by Figures 10, 11 and 12.

EFFECTS OF THE LOAD ON THE HANGER AND TIMBER.

The tests that have been made on single hangers of the stirrup type, *i. e.*, those which are supported from the top of the carrying-beam, show that the first effect of loading is to compress the timber under the top flanges. Thus, Mr. W. A. Tyrell, C. E., who made a test for Messrs. Mauran, Russel & Garden, Architects, of St. Louis, last April, says of the wrought-iron stirrup, made from 3 inch x ⅜ inch iron, that it began to fail very early by crushing the wood on the near side and rising on the far side, and that when the load on the hanger reached 3,500 pounds it had crushed into the wood about ⅛ inch and had risen 1 inch. Under this load, the tensile-stress in the sides of the stirrup was only 1,555 pounds per square inch, or only about one-eighth of the safe working strength of wrought-iron.

When the load reached 5,000 pounds the hanger had bent to such an extent that it was in danger of slipping over the carrying-beam, and the tail-beam was blocked up. At the time of practical failure, therefore, the stress in the sides of the hanger was but 2,222 pounds per square inch.

In the test made at the Massachusetts Institute of Technology in April, 1900, a common stirrup, made from ⅜ inch x 2½ inch wrought-iron, bent and pulled over the trimmer at a load of 13,750 pounds or at a stress of 7,333 pounds per square inch. Figure 1 gives a pretty fair idea of the way in which the hanger bent and of the extent to which it crushed into the carrying-beam. Of course the hanger settles with the crushing of the wood and the floor settles with it.

The stirrup tested at the Institute of Technology, although having a smaller sectional

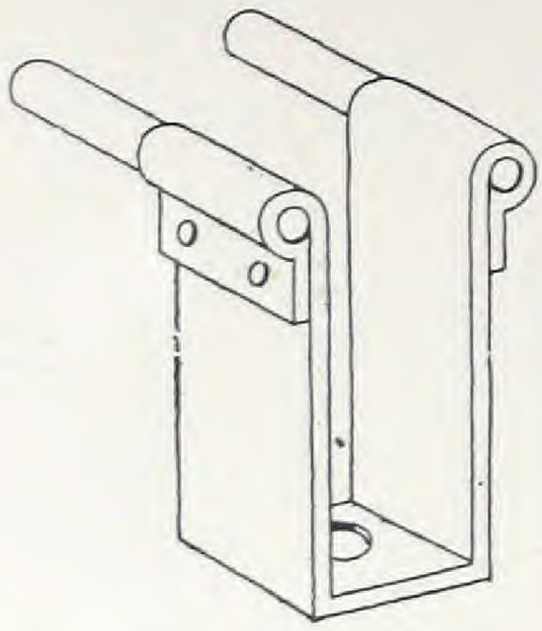


Fig. 7. The Rieseck Hanger.

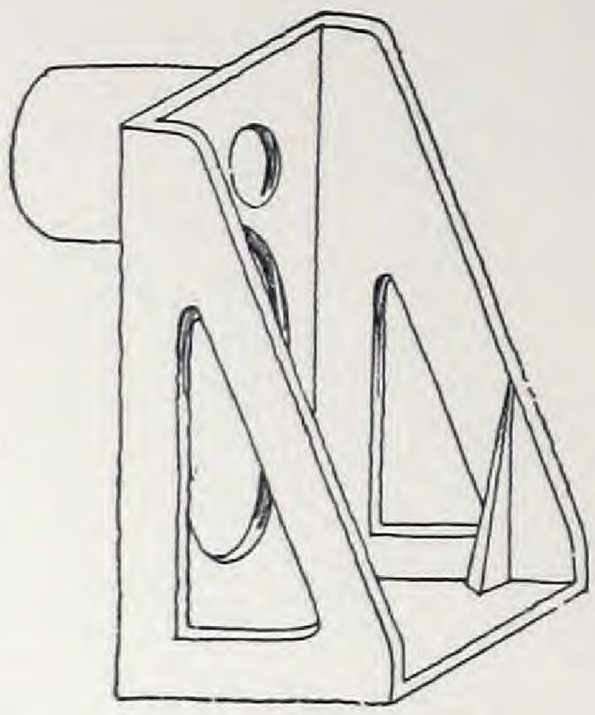


Fig. 8. The Duplex Hanger, up to 6 inch x 12 inch.

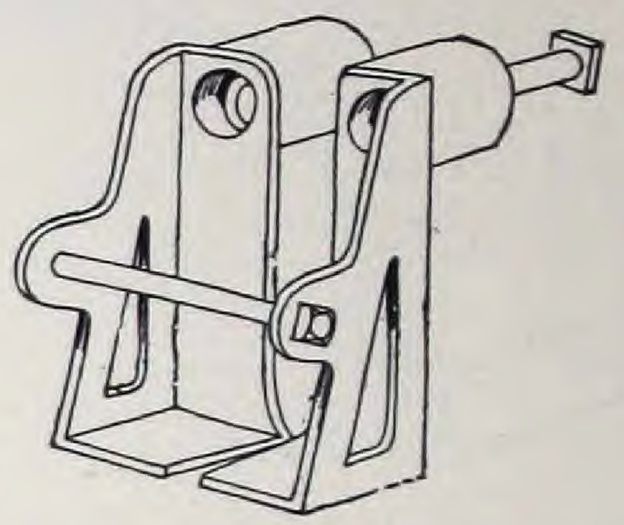


Fig. 9. The Duplex Hanger for 8 inch x 12 inch and over.

area, offered greater resistance to bending than the one tested by Mr. Tyrell, probably because the carrying-beam was only one-half as thick in the former case as in the latter.

Theoretically, the wider the carrying-beam the greater will be the bending-moment on the top of the stirrup, but as soon as the iron lifts off from the back edge of the beam then, of course, the bending-moment is concentrated near the front edge. The tests previously referred to show that the patent stirrups fail in the same manner as the common stirrups, *i. e.*, by the crushing of the wood and straightening out of the top flanges.

Thus, a 6 inch x 12 inch Van Dorn hanger began to straighten out at a load of 13,300 pounds and failed, *i. e.*, slipped off, at a load of 18,750 pounds, showing a little greater resistance to bending than the common stirrup. The Van Dorn hanger was spiked to the carrying-beam with two spikes in each top flange, and three in each side flange. In the test made by Mr. Tyrell, a 10 inch x 14 inch Van Dorn hanger crushed down the wood at the near side, and rose about ¼ inch at the ends, under a load of 5,500 pounds. This hanger was also spiked to the carrying-beam.

The Van Dorn Iron Works Company report a test in which 50,000 pounds were supported by four of their 3 inch x 14 inch hangers without the least observable effect on the hangers; but in this case the timbers were of oak, which offers the greatest resistance to crushing across the grain of all framing timber, and the load did not reach the point at which the hanger began to fail in the Massachusetts Institute of Technology test.

The hanger which failed in the Minneapolis warehouse was of the same shape as the National hanger, and appeared to have been made from a 2 inch x 4 inch x ¼ inch steel angle, with the 4-inch flange sheared and bent to the shape shown in Figure 13, and the 2-inch flange entirely cut out under the seat for the beam. The top of the hanger was riveted to an 8 inch x 16 inch x ¼ inch plate by four ⅜-inch rivets through the 2-inch flange. A small angle-bar was also riveted to the rear edge of the wall-plate.

According to figures and sketches prepared for the *Engineering News* by Mr. G. A. Turner, M. Am. Soc. C. E., of Minneapolis, the actual load on the hanger which failed was about 15,000 pounds and failure was due to crushing of the inner edge of the brick wall under the hanger, and the bending of the latter until it was pulled out of the wall.

Figure 14 shows the appearance of the hanger after failure, and also the distortion in the wall-plate, which was too thin to distribute the load evenly over the wall.

Attention is also called to the manner in which the bottom of the hanger was bent, which illustrates another weak point to be guarded against in all stirrups, where the beam is 8, 10 or 12 inches wide. In this particular instance, the beam was 12 inches wide, and was supported on a shelf 4 inches wide, ¼ inch thick and 12 inches between supports. The total load for which the beam was designed was 38,500 pounds, which would give a reaction on the hangers of 19,250 pounds. "Considered as a uniform distributed load, this reaction would produce a bending-stress in the shelf about ten times the ultimate strength of the steel. The shelf will, therefore, be bent down so that the joist bears only along the side edges, and these, in turn, will be crushed until the hanger becomes virtually a suspension-band. The stress in this band, practically pure tension, with a sag of 1 inch, would amount to nearly 30,000 pounds on a section of 1 square inch."[1]

[1] *Engineering News*, November 20, 1902.

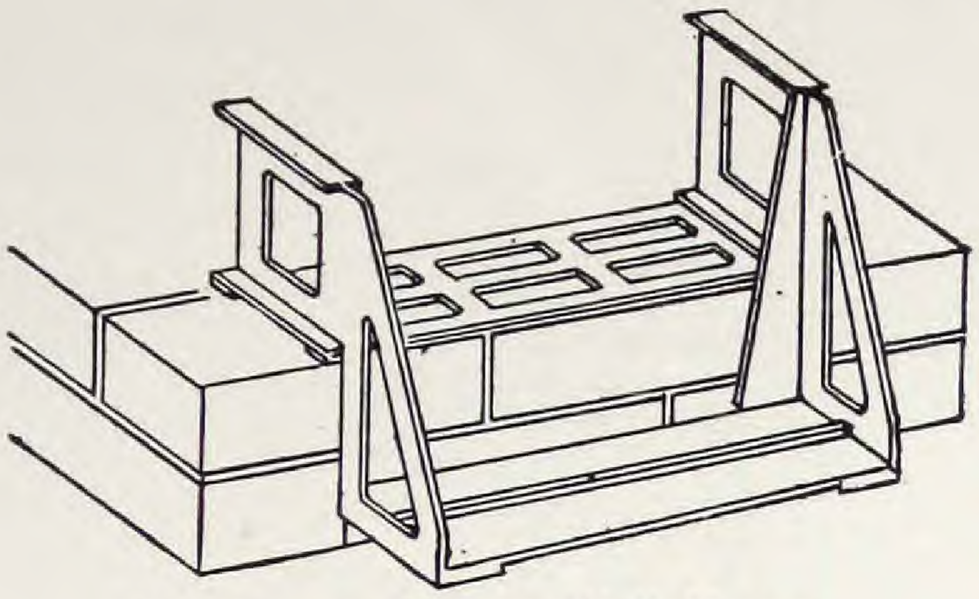


Fig. 11. A Duplex Wall Hanger.

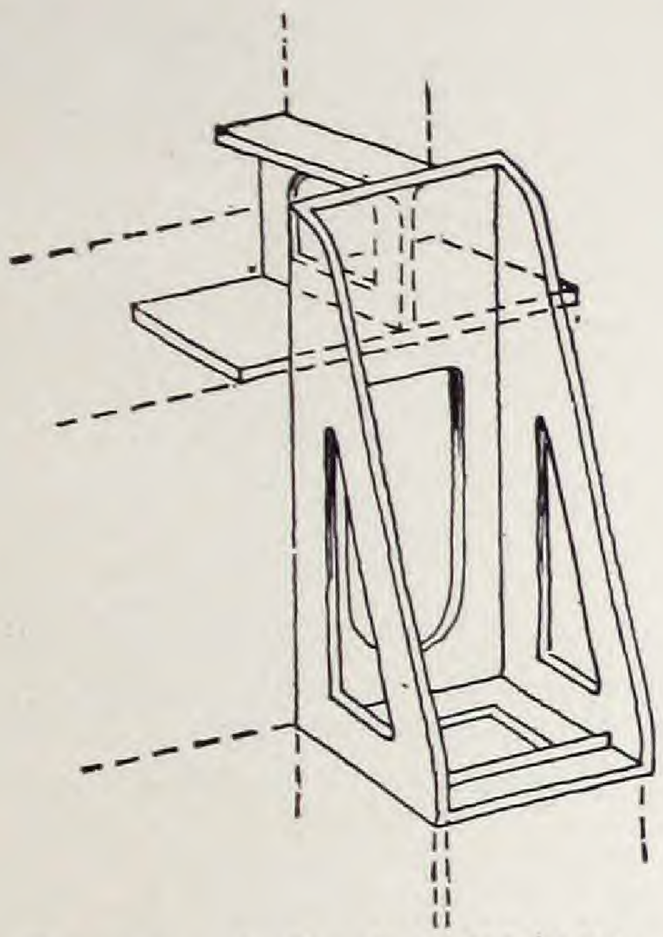


Fig. 10. A Duplex Wall Hanger.

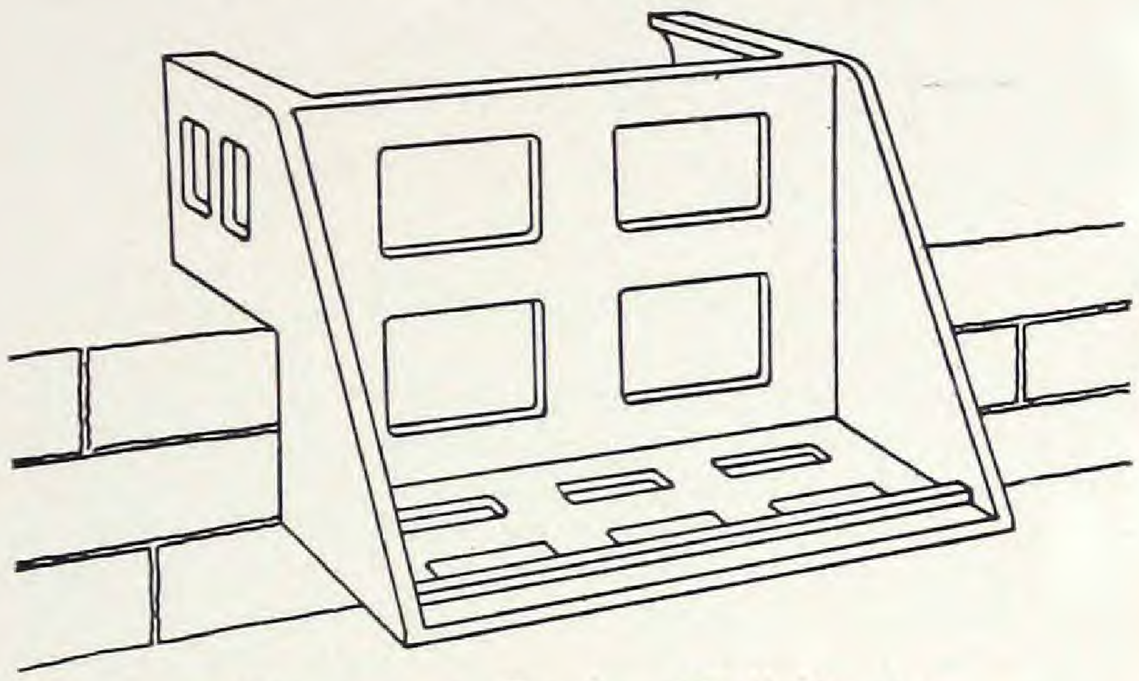


Fig. 12. A Duplex Wall Hanger.

When a steel stirrup cannot fail by bending and slipping from the support, it is most likely to fail by breaking at one of the bottom angles. At this point the shear is equal to one-half of the load on the stirrup, and owing to the bend in the steel or iron, this is usually the weakest part of the metal.

In the warehouse at Minneapolis, the upper floor in falling carried with it the five floors below, and the hangers supporting these five floors failed at the junction of the bottom shelf with the bottom of the hanger; in most cases the bottom of the stirrup was straightened down vertically as though it were a strap, hinged to one side. These hangers were not as heavily loaded as those supporting the sixth-floor beams, and probably had not suffered any deformation at the time the failure occurred, and the sudden shock caused the hangers to break at the weakest point.

Strength of Double Stirrups.—While the bending effects in a double stirrup are similar to those in a single stirrup, particularly in the bottom shelf, yet because of their being double, they cannot slip over the carrying-beam, and the metal must necessarily break before the beams can fall. The only test on a double stirrup that has come to my knowledge is one made by the Otis Steel Company, of Cleveland, November 9, 1900.

The stirrup in this case was made to receive two 8 inch x 12 inch timbers, and to set over a 12 inch x 14 inch girder. The metal was ⅜ x 2½ inch, bent and twisted in the usual way. At 57,650 pounds on both beams, the stirrups broke at one of the lower corners, showing that the weakest point is at these corners, as previously noted.

The girder was compressed $\frac{5}{16}$ inch where the stirrup was applied; the bottom of the stirrup bent ½ inch and the top about the same as you can see (Figure 15.)[2]

The tensile-stress in the sides of the stirrups at the time of failure was 15,732 pounds per square inch.

Strength of the Goetz Hanger.—I know of no definite tests of strength of the Goetz stirrups, but have been told that the slanting hook has a more injurious effect on the carrying-timber than if it were at right angles to the face of the beam.

Owing to the hooks having a circular section, they are better adapted to resisting a bending strain than a flat section of the same area. Round pins also do not appear to crush into the timber as much as flat bars.

Strength of the Rieseck Hanger.—I know nothing of this hanger except what is stated in the manufacturer's circular, and no tests are quoted.

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[2]This stirrup and also the stirrup shown in Figure 1 were exhibited at the meeting.

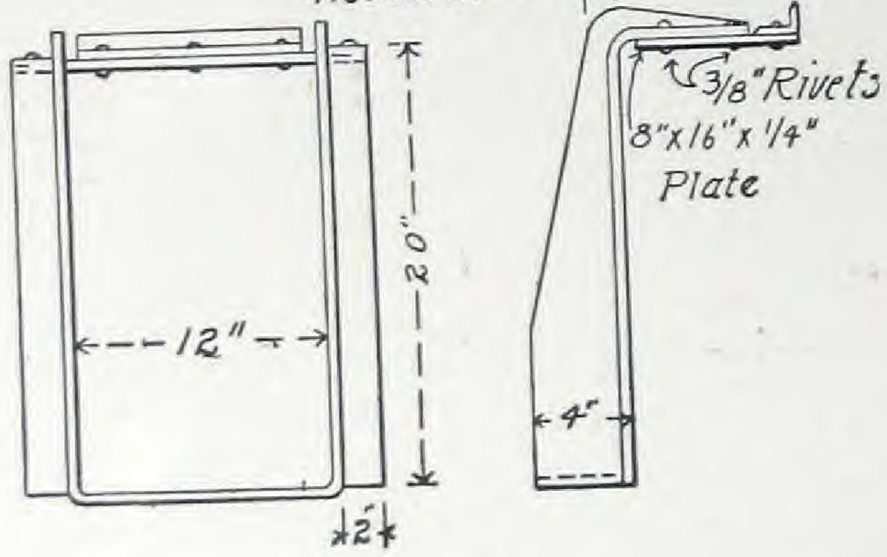


Fig. 13.

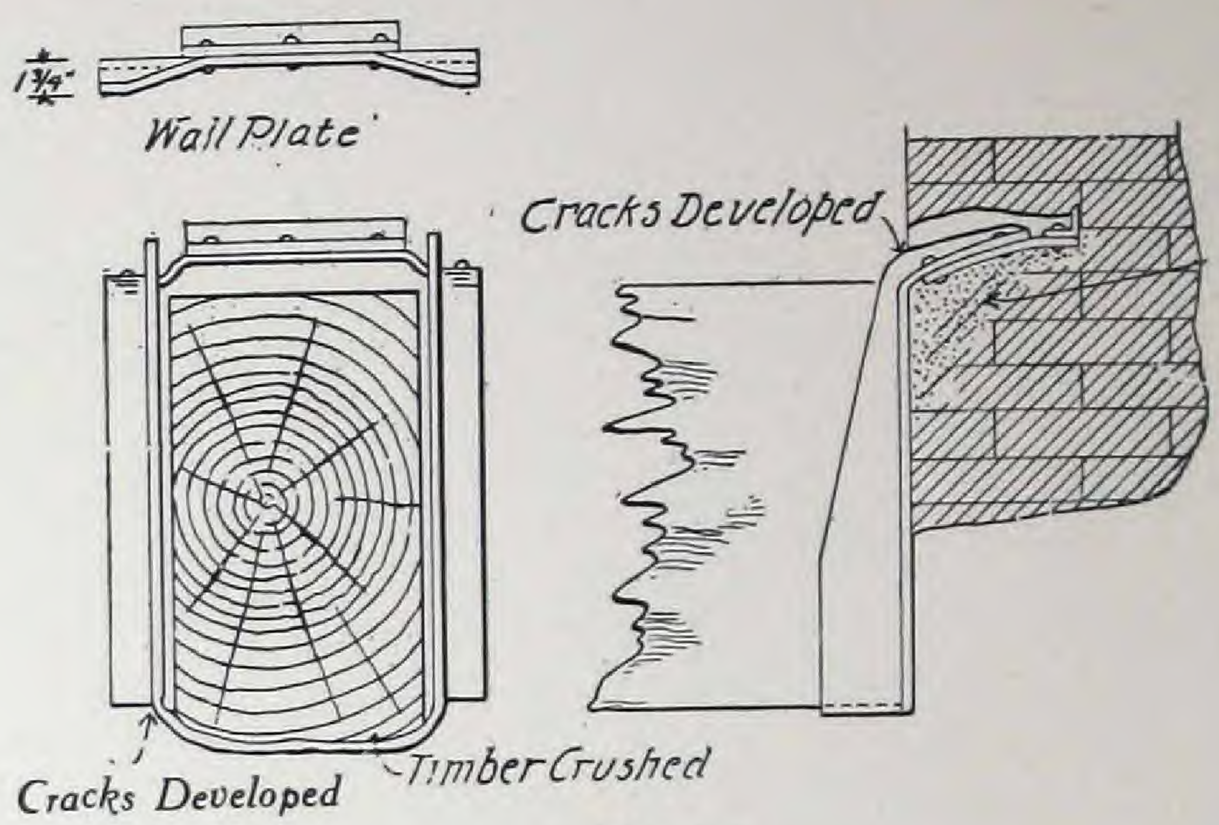


Fig. 14.

The Hanger that failed in the Bement-Darling Warehouse, Minneapolis.

There is probably no question as to the strength of the strap, when the beams are not more than 8 inches thick. The only criticism that I have to make is the bending-moment on the arms and the leverage which they must exert on the top of the carrying-beam. If the arms were solidly fixed in an unyielding material, the theoretical bending-moment on each arm would equal one-half of the load multiplied by one-half of the width of the strap. Practically, the bending of the floor-beam will naturally throw a large proportion of the weight on the outer edge of the seat, which will increase the bending-moment, and the bending-moment will bring a considerable pressure on the outer fibres of the carrying-beam, and any crushing of the latter will still further increase the bending-moment. Without wishing to injure the reputation of the hanger, I do not think this is as good a pattern as the Goetz hanger.

Strength of the Duplex Hanger.—When these hangers were first put on the market, many persons were afraid that, being of annealed cast-iron, they would be unreliable, and it was also feared that the holes bored into the carrying-timber would weaken it.

As to any possible danger resulting from imperfect annealing, there is this to be said, that many millions of these hangers are now in actual use in buildings, a great many of them having been in place from eight to ten years, and the only accident resulting from their use that is known to have occurred was at the Sears-Roebuck Building in Chicago, where a wall-hanger designed for 10 inch x 10 inch to 10 inch x 16 inch beams was used to support a 19 inch x 16 inch flitch-plate girder, loaded with pressed brick and cement to the neighborhood of 1,000 pounds per square foot.

I have also been assured by the manager of the company that every hanger is thoroughly tested before it leaves the factory.

The strength of the Duplex hangers, as shown by carefully conducted tests, exceeds that of the stirrup hangers, when made of the usual thickness of metal, *i. e.*, when the strength of the stirrup is measured by its resistance to bending. (They also crush the wood less than any other hanger.)

In the tests conducted by Charles E. Fuller at the Massachusetts Institute of Technology in April, 1900, one 4 inch x 12 inch Duplex hanger failed at a load of 13,600 pounds by the breaking out of the bottom of the hanger.

Another hanger of the same size failed under a load of 14,360 pounds by breaking off under the nipple.

As the safe distributed load for a Georgia pine beam 4 inch x 12 inch, 12 feet long, is 9,600 pounds, the end reaction would be 4,800 pounds so that the hangers have a safety-factor of about three for that length of beam, while for a white-pine beam of same length the safety-factor would be nearly five.

A No. 35, two part Duplex hanger tested at the same time failed under a load of 39,550 pounds by one side breaking off short under the nipple.

In the test made by Mr. Tyrell, at St. Louis, a No. 75 Duplex hanger carried a load of 38,000 pounds without any apparent effect on the hanger.

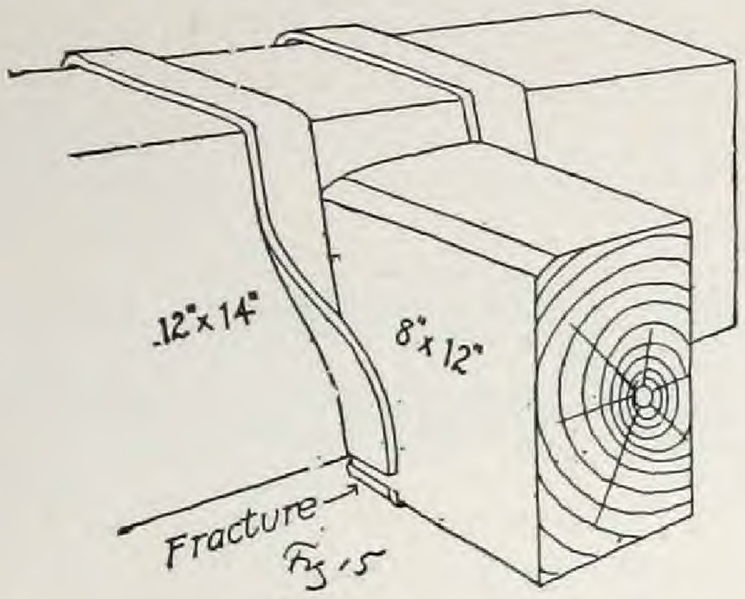


Fig. 15. Failure of a Double Stirrup.

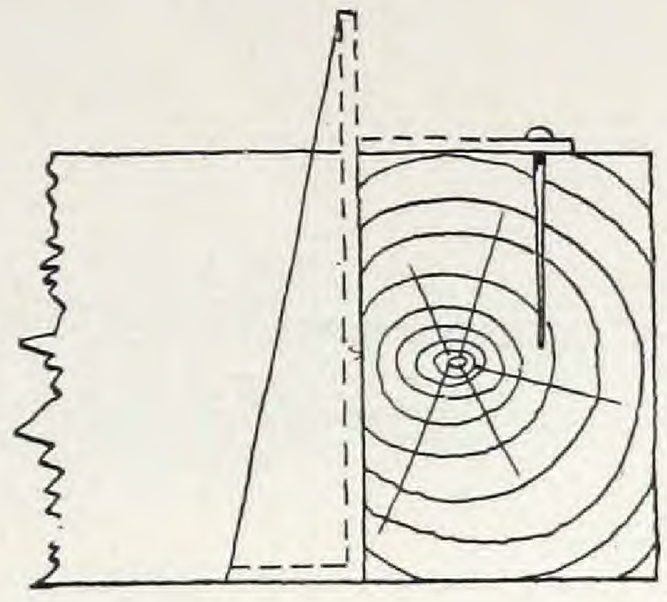


Fig. 16.

I have the statement from the Duplex Hanger Company that they have tested their No. 75 hanger to over 60,000 pounds without a sign of fracture; this would be equivalent to a distributed load on the joist of 120,000 pounds, or over 600 pounds per square foot over an area of 12 feet x 16 feet.

We will now look at the effect on the carrying-beam of the holes bored for the nipples.

In the case of the two 4 inch x 12 inch hangers tested, the load had no injurious effect on the header except to slightly compress the bottom of the hole. In the case of the No. 35 hanger a slight longitudinal crack appears to have been developed about opposite the centre of the holes and the bottom of the holes was compressed about $\frac{3}{16}$ inch.

During the test of the No. 75 hanger, at St. Louis, when the load reached 27,360 pounds a slight crack was developed in the girder between the spools, and extended a short distance on both sides. Under the final load of 38,000 pounds this crack had increased slightly in length and width, the washers on the far side having sunk about $\frac{1}{8}$ inch into the timber. The joist was crushed about $\frac{1}{4}$ inch where it rested on the hanger.

From these tests, and general observations where the hangers have been used in actual construction, the holes for the spools do not appear to have any injurious effect upon the carrying-beam, until the loads exceed the safe loads for the timber beams and girders.

The only case in which the weakening effect of these spools would need to be considered would be where a number of the larger hangers were used close together, in which case it would seem wise to increase the thickness of the carrying-timbers sufficiently to make good any weakening effect of the holes. This would also be true in regard to the Goetz and Rieseck hangers.

CONCLUSIONS.

The conclusions that may fairly be drawn from the preceding analysis are in part, at least, as follows:

First—That it is impossible to determine the safe carrying-capacity of a stirrup hanger directly from the tensile strength of the steel or iron, unless better provision is made for uniformly distributing the load over the top shelf. The ideal stirrup would be constructed with a bracket above the hooks, as in Figure 16, strong enough to prevent the latter from straightening, in which case the full stress would be thrown on the lower angles of the steel or iron. This has been attempted to some extent in the National hanger.

Second.—That it is not advisable to use less than $\frac{3}{8}$-inch thickness of metal for common stirrups, except where light beams are to be supported.

Third.—That the patent stirrup hangers are, as a rule, made too thin.

Fourth.—Wherever a stirrup is used to support a heavily loaded timber, or the end of a truss or girder, the bearing of the metal on wood, the resistance to bending or straightening of the top hook, or flanges, and the shearing or tearing of the metal at the bottom corners should all be very carefully considered.

Fifth.—That the Duplex hangers give ample strength for the size of beams for which they are intended, except possibly, where a very short beam is loaded to its full capacity, in which case the load on the hanger should be computed and compared with the data given above.

The advantage of the Duplex and Goetz hangers in lessening the settlement due to shrinkage in the carry-timber has already been referred to.

In regard to wall-hangers, the same principles apply to them as to joist-hangers, the best hanger being that which is so designed as to most perfectly distribute the load over the bearing surface of the masonry, while at the same time possessing the requisite tensile strength in the sides and bottom. For distributing the weight on the wall, there is certainly no wall-hanger now on the market which approaches the Duplex, and if steel hangers could be economically made on the same pattern they would give the ideal construction.

THE DUPLEX HANGER COMPANY

THE BUREAU OF BUILDINGS.

FOR THE BOROUGH OF MANHATTAN.

OFFICE OF SUPERINTENDENT

No. 220 FOURTH AVENUE,

S.W. CORNER 18TH ST.

BY *The City of New York,* May 7, 1907.

THE DUPLEX HANGER CO.,

Gentlemen:-

As a result of the tests on April 19th, 1907, at Columbia University, under the superivision of this Bureau, the "Duplex Hangers" are hereby approved for general use in the Borough of Manhattan, for loads up to one-quarter those shown in said test, as specified in Section 137 of the Building Code.

Additional tests are to be provided if required by this Bureau.

Yours truly,

Edw Murphy.

Superintendent.

THE DUPLEX HANGER COMPANY

Department of Buildings.

Joseph Downey, Commissioner.

Chicago, August 1st, 1895.

Orr & Lockett,

50 State St.,

City.

Gentlemen:-

In answer to your letter of the 29th inst. asking my opinion in regard to the merit of the " Duplex Hanger" would say that after a careful examination and some inquiry as to the action of fire on the " Hanger" I write to say to you that I consider the " Duplex Hanger" just what is needed for the support of joists, especially so for dwelling house purposes, and think it has merit enough to be very popular with the Building Interests.

Respectfully,

Joseph Downey

CITY OF BOSTON.

BUILDING DEPARTMENT.

Office of the Building Commissioner.

Old Court House, September 17, 1900.

To whom it may concern.

Having carefully examined the "Duplex Hanger" submitted by the N E Bolt and Nut Co. I find it is calculated, by reason of its constructive proportions to carry any load that a hanger may be called upon to carry

It not only possesses the elements of strength, but in case of fire would release itself without danger to the walls.

Respectfully

John L Damrell

Building Commissioner

Minneapolis, Minn. Jan. 22; *1892.*

Whereas:-- The National Association of Commissionars and Inspectors of Buildings assembled in Convention at the City of Cleveland, Ohio, were invited to inspect the application of the Duplex Joists Hangers in several buildings,

Resolved:- That after personal inspection we find the Duplex Joists Hanger to fulfill all requirements claimdd for it.

Resolved:- That the Secretary be instructed to send a copy of this resolution to the Duplex Hanger Company of Cleveland, Ohio.

J.M. Hazen Secy.

THE DUPLEX HANGER COMPANY

THE UNIVERSAL MERCANTILE SCHEDULE

OF THE

BOARD OF UNDERWRITERS

OFFERS A PREMIUM FOR USING OUR

DUPLEX WALL HANGERS

OFFICERS:
THOMAS R. OEER, President.
M. BUCHMANN, Vice-President.
W. B. MAXSON, Treasurer.
A. I. TRUESDELL, Secretary.
H. O. HOPKINSON, Supt. of Surveys.
C. W. CLEVELAND, Elect'l Inspector.

OFFICE OF

THE CLEVELAND BOARD OF UNDERWRITERS.

689 ARCADE.

Cleveland, Ohio. January 19th, 1895.

The Duplex Hanger Co.,

84 Pearl St., Cleveland.

Gentlemen:--

Replying to your inquiry, will say that your Duplex Joist Hangers, anchored in brick walls so as to make the joists self-releasing in case of fire, will entitle buildings used for mercantile purposes, to 1 % reduction in their rate of insurance, as provided by the Universal Mercantile Schedule.

Yours respectfully,

A. I. Truesdell

Sec'y.

THE DUPLEX HANGER COMPANY

Form 105-3000-8-94

CHAS. A. HEXAMER,
SECRETARY.
W. A. PORTER,
SUPT. SURVEY DEPT.
WM. McDEVITT,
CHIEF ELECTRICAL DEPT.

Philadelphia
Fire Underwriters' Association,

136 AND 138 SOUTH FOURTH STREET.

ADDRESS ALL COMMUNICATIONS TO THE ASSOCIATION OR ITS SECRETARY.

Philadelphia, April 23d, '95.

The Duplex Hanger Co.
Cleveland, O.

Gentlemen:-

At a meeting of the Committee of this Association held this morning, the Duplex Hanger Co.'s self releasing hanger was accepted, and ordered placed on the list of approved devices for improvements in construction of buildings.

Yours respectfully,

Chas. A. Hexamer.
Secretary.

OFFICE OF

Ohio Inspection Bureau,

Board of Trade Building.

J. W. COCHRAN, MANAGER

Columbus, O., February 5th, 1895.

-:::- Duplex Framing & Wall Joist Hanger -:::-

The Duplex Hanger Co.

Cleveland, O.

-----ooo-----

Gentlemen:-

I have examined the sample of Duplex Framing and Wall Joist Hanger:

As this acts upon the same principle as the old style ledged wall in making joist of building self-releasing, the usual credit of 5 cents in the rate will be made in all buildings where it is used.

Yours very truly,

J. W. Cochran

THIS IS TO CERTIFY

THAT

THE ILLINOIS CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS

AWARDED A

MEDAL FOR MERIT

To *The Duplex Hanger Co*

for *Its Exhibit of Joist Hangers*

IN THE

FIRST ANNUAL CHICAGO BUILDING TRADES AND MATERIAL EXHIBITION

HELD IN THE

Institute of Building Arts.

MAY 15 TO JUNE 2, 1894

Edward G. Bush
Chairman Jury of Awards

H. W. Rice
Manager

THE DUPLEX HANGER COMPANY

RESULTS OF TESTS MADE AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY AT BOSTON

Test No. 1 Verbatim Report

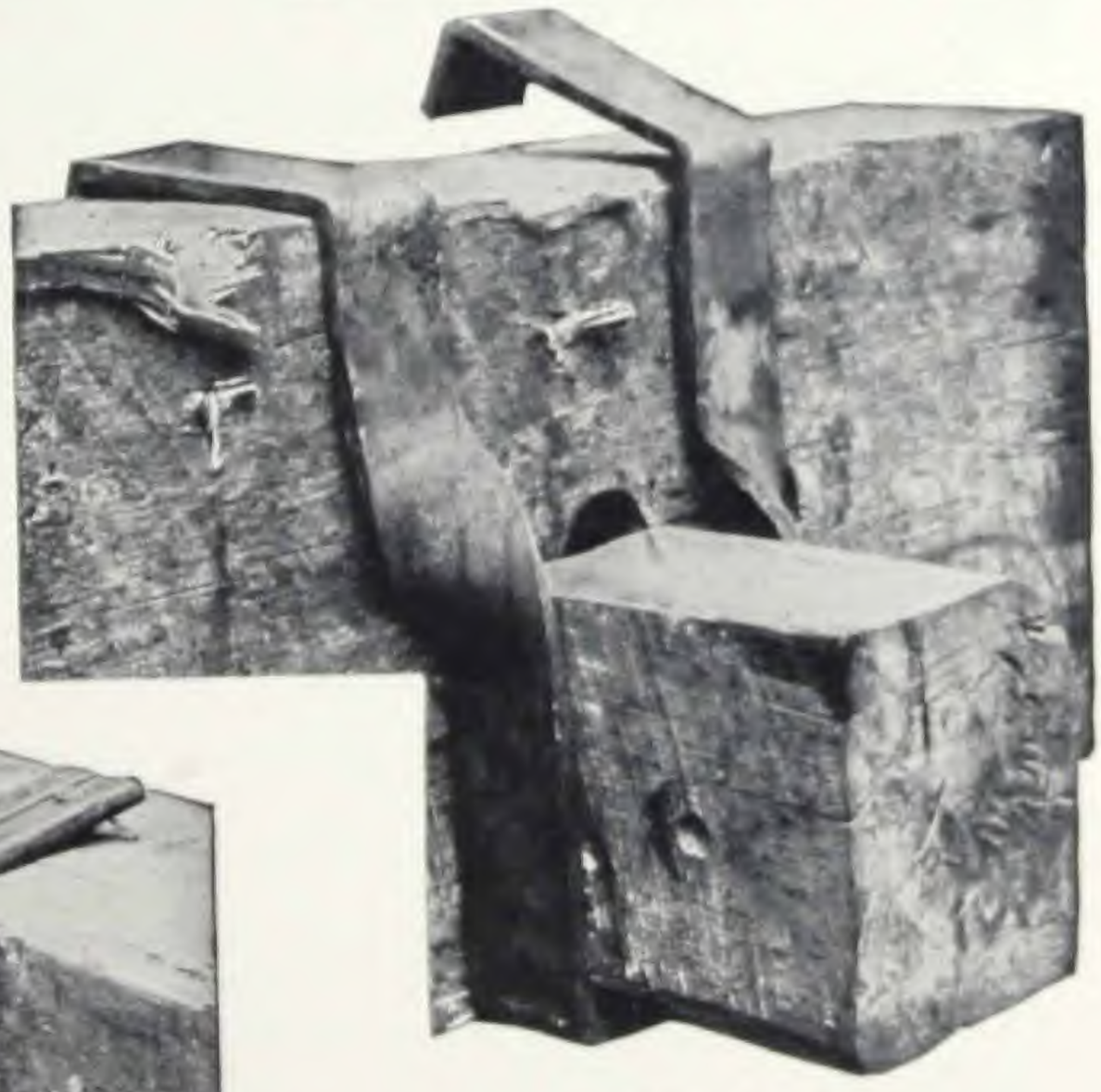
NOTE.—This cut shows the exact condition of Hanger and timber after 39,550 pounds were applied.

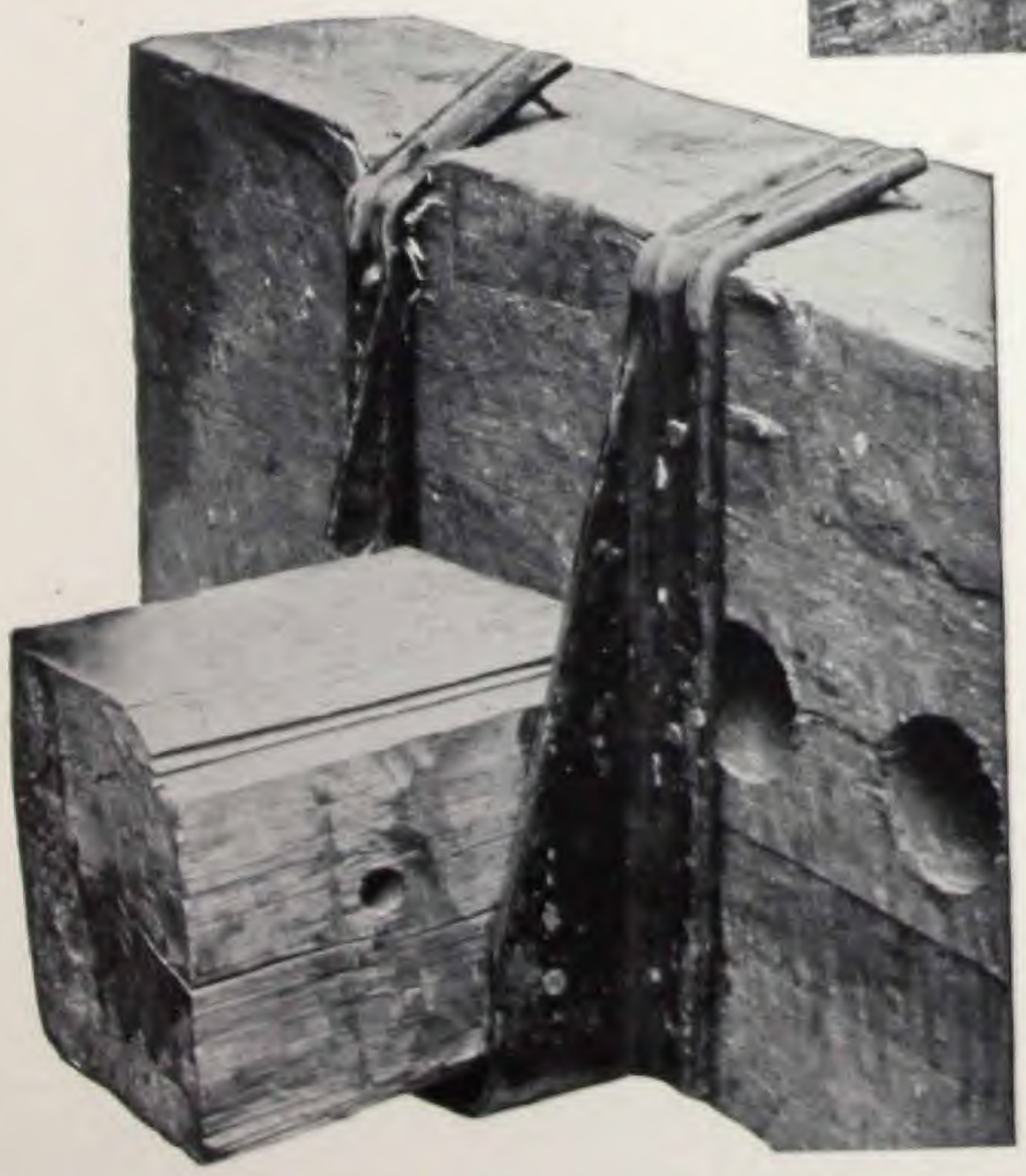
"This test was made on a Duplex Hanger, designed to carry timber from 6-inch x 12-inch up. The hanger was bolted to a hard pine header with two ¾-inch bolts. It was loaded as shown in the sketch, one end of the I-Beam being hung in the hanger and the other end on an iron bar. A block of hard pine 7-inch thick was bolted in the hanger under the I-Beam. At a load of 20,000 pounds the wood began to shown signs of failing. The hanger held, however, until a load of 39,550 pounds was applied, when one side broke off short under the nipple projecting into the header."

Test No. 2 Verbatim Report

NOTE.—The crushed parts of the header are the points where the stirrup was hung for the test.

"This test was made on a stirrup iron for 6-inch x 14-inch timber, made from ⅜-inch x 2½-inch wrought iron. The hanger was loaded in the same manner as in Test No. 1. At a load of 13,750 pounds the hanger failed by pulling over the header."





Test No. 3

NOTE.—This cut shows the exact position and condition of hanger after test.

This test was made on a 6-inch x 12-inch Van Dorn hanger, after the same manner as Test No. 1. The hanger began to straighten out at a load of 13,300 pounds, and failed at a load of 18,750 pounds.

[Signed] CHARLES E. FULLER,
M. E. D. Dept., M. I. T.

Comparative Strength of Different Hangers as Shown by These Tests

DUPLEX	39,550 LBS.
STIRRUP	13,750 LBS.
VAN DORN	13,300 LBS.

THE DUPLEX HANGER COMPANY

IRA H. WOOLSON. E. M.
CONSULTING ENGINEER ON TESTS OF MATERIALS.
ENGINEERING BUILDING, COLUMBIA UNIVERSITY.
TELEPHONE, 1400 MORNINGSIDE.

NEW YORK, May 20, 1907. 190

COLUMBIA UNIVERSITY

Department of **Mechanical Engineering.**

The Duplex Hanger Company,

Cleveland, O.

Gentlemen:-

The following data gives the results obtained from tests upon Duplex Wall Hangers of varying sizes. The tests were made upon an Olsens testing machine of 400,000 pounds capacity.

An idea of the methods of adjusting the specimens for the purpose of testing can be obtained from the attached photos. The other photos show the condition of several of the hangers after being tested.

For the purpose of testing the hanger one end of the beam was placed in the hanger, the other end resting on pine blocking spaced to give a clear span of 6 ft., as shown on photograph of testing machine.

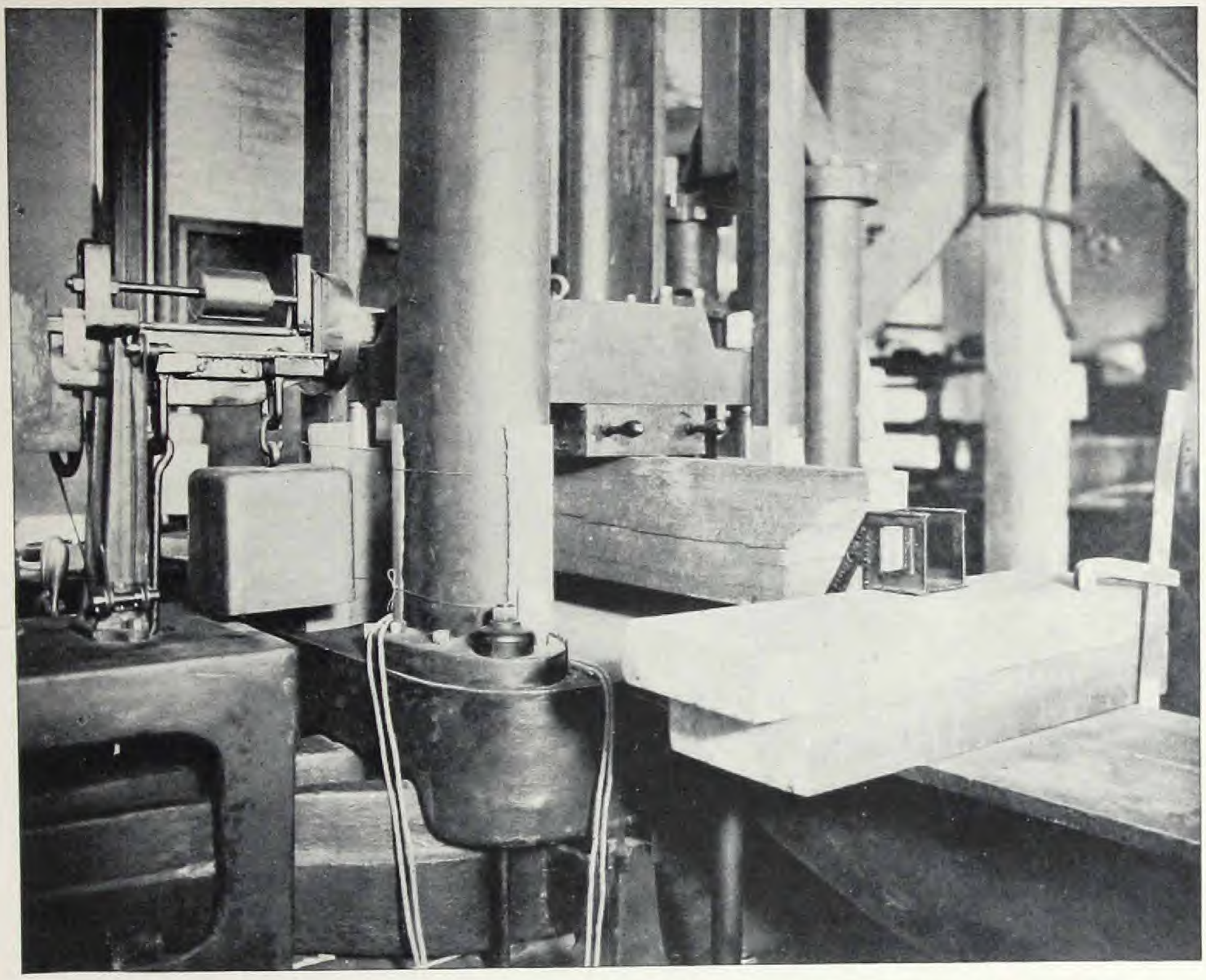
In justice to the Wall Hanger it should be stated that supporting them upon wooden blocks instead of solid masonry allowed them to indent in the blocks somewhat and permitted them to get out of position to a certain extent.

The tests were carried on in co-operation with the Bureau of Buildings in this City and were witnessed by the following Bureau Engineers

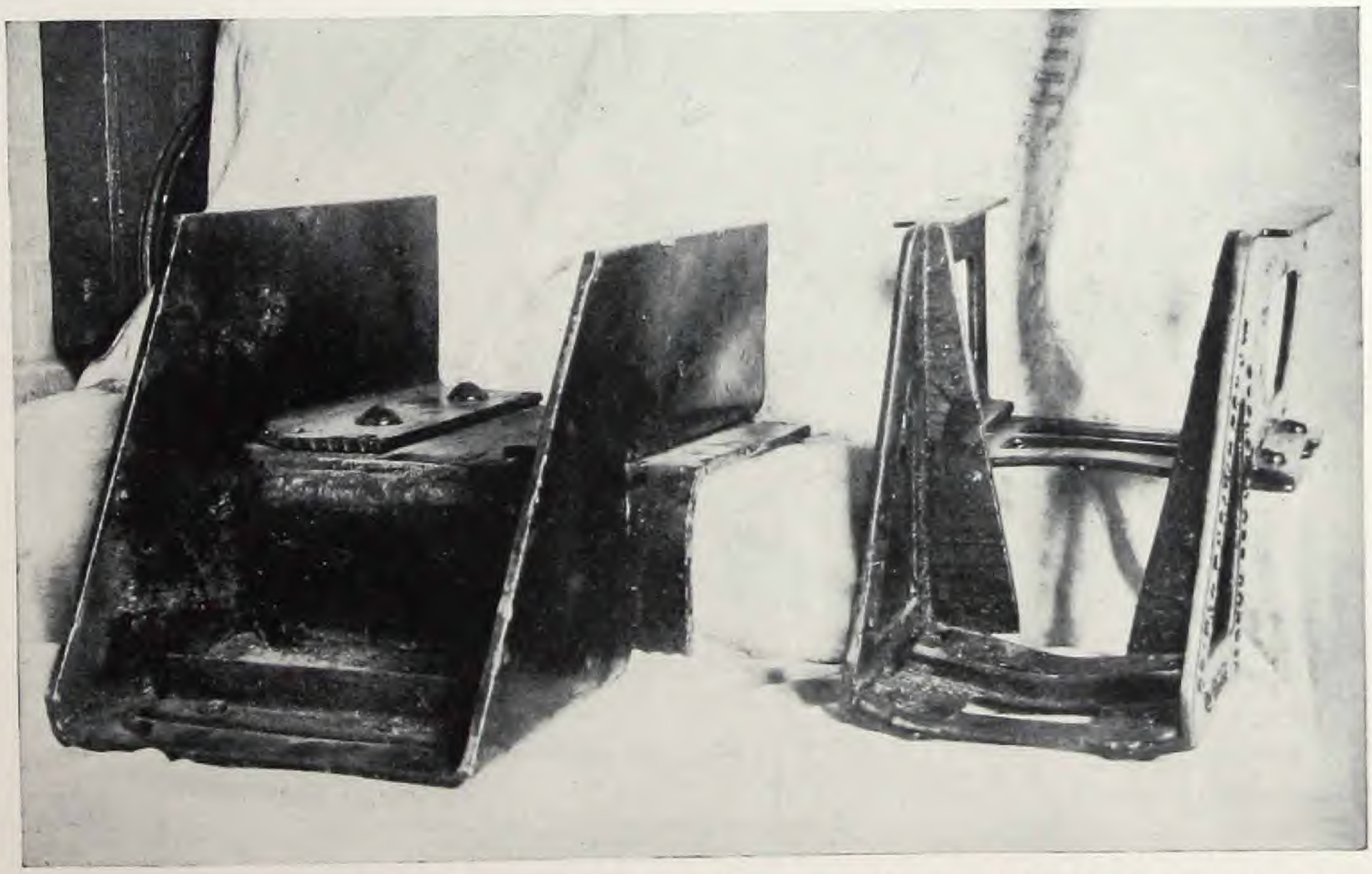
A. Schwartz, Borough of Manhattan.
Thomas Heatley " " The"Bronx
Harry Brown, " " Richmond
Inspector McGarry, " " Manhattan.

Yours respectfully,

46 Ira H. Woolson



View of Testing Machine Showing Method of Testing Duplex Wall Hanger



This Photograph Shows Condition of Nos. 600 and 800 Duplex Wall Hangers After Test

Test upon Wall Hanger No. 140.
Designed to carry 2" beams.

Results:	Remarks
Load pounds	
13630	Beam commenced to shear.
14850	Beam failed by tension.

The fracture of the beam showed it to be dry rotted and it consequently failed at a comparatively low load.

Test upon Wall Hanger No. 210.
Designed to carry 3" timber

Results:	Remarks:
Load pounds	
21350	Wood compressing under wall bearing plate
26400	Wood compressed 1/4"
26930	Beam failed by horizontal shear

The timber bearing plate of the hanger was slightly distorted, but was otherwise in good condition.

Test upon Wall Hanger No. 280.
Designed to carry 4" beams.

Results:	Remarks:
Load pounds	
17780	Beam cracking
35680	Wood compressed under wall bearing plate 1/8" beam started to fail in horizontal shear.
35750	Beam failed.

Hanger not affected by test.

Test upon Wall Hanger No. 600.
Designed to carry 6" beams.

Results:	Remarks:
Load pounds	
31530	Support started to compress under wall bearing plate.
41000	Support compressed 1/4" under wall bearing plate.
46000	Timber bearing plate tore away from back of hanger and bearing plate considerably distorted.

The condition is plainly shown in photograph.

Test upon Wall Hanger No. 800.
Designed to carry 8" beams

Results	Remarks
Load pounds	
52520	Blocking tipped up 1/2"
53000	Beam commenced to fail
55120	Beam failed by horizontal shear
55400	Maximum Load.

Hanger in good condition as shown in accompanying plate.

THE DUPLEX HANGER COMPANY

REPORT OF TEST AT MILWAUKEE

The above is a photographic view of a test made at the Edward P. Allis Co., Milwaukee, Wis., in the presence of a number of prominent architects and builders. The platform was constructed of 14 x 16 hard pine timber 16 feet long.

On one side the timbers were framed in Duplex Hangers, and on the other side steel hangers and stirrups were used.

22 tons of pig iron were placed on the side where the Duplex Hangers were used.

16 tons of pig iron were placed on the side where steel hangers and stirrups were used.

The result showed that the steel hangers and stirrups loaded at 750 pounds per square foot failed, while the Duplex Joist Hangers loaded uniformly at 850 pounds per square foot showed no effect, and were intact on the removal of the load after 48 hours.

This test was made on December 29th, when the thermometer was 3 degrees below zero.

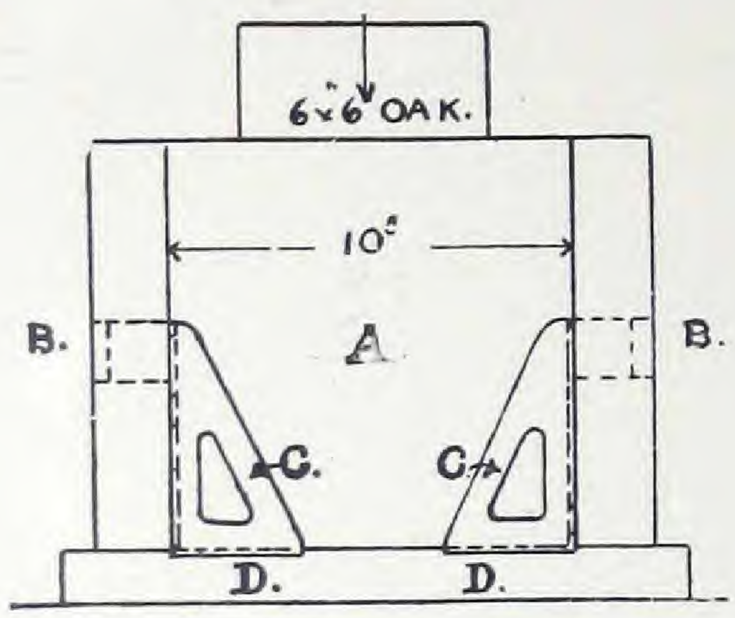
We, whose names appear herewith, were present at the test, and hereby certify to the correctness of the same.

E. W. Tucker, M. E.
H. C. Koch,
C. F. Ringer,
Armand D. Koch,
Eugene R. Liebert,
Alexander C. Eschweiler,
Robert Messmer,
H. S. Pelton,
John Menge, Jr.,
Arthur S. Vogel,
Arthur E. Gross,
Vice-Pres. Phillip Gross Hdw. Co.

THE DUPLEX HANGER COMPANY

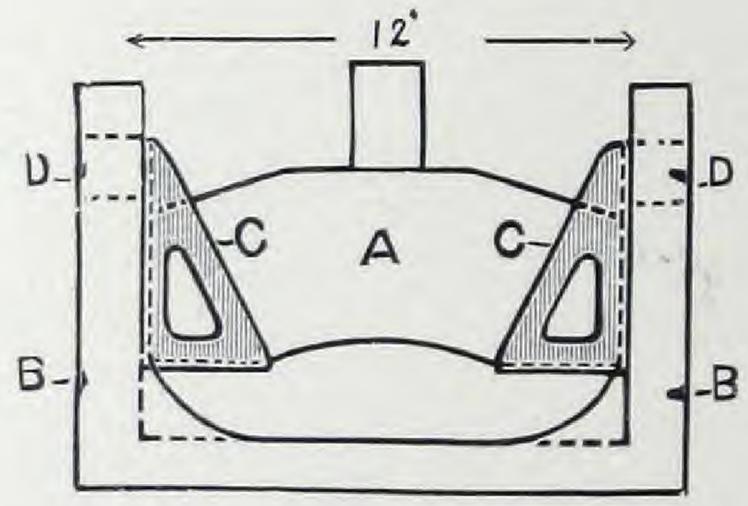
RESULT OF TESTS OF THE DUPLEX JOIST HANGER MADE BY THE OTIS STEEL COMPANY, LIMITED, OF CLEVELAND, OHIO

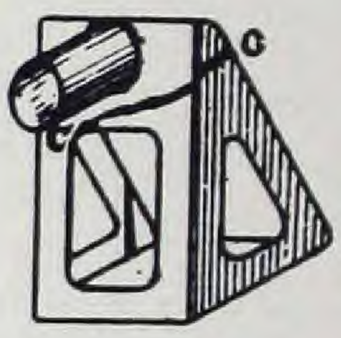
Tests Nos. 1, 2 and 3 were made with our smallest Joist Hanger No. 10, which is of our lightest manufacture. Test No. 4 was made with our No. 20 Duplex Joist Hanger.



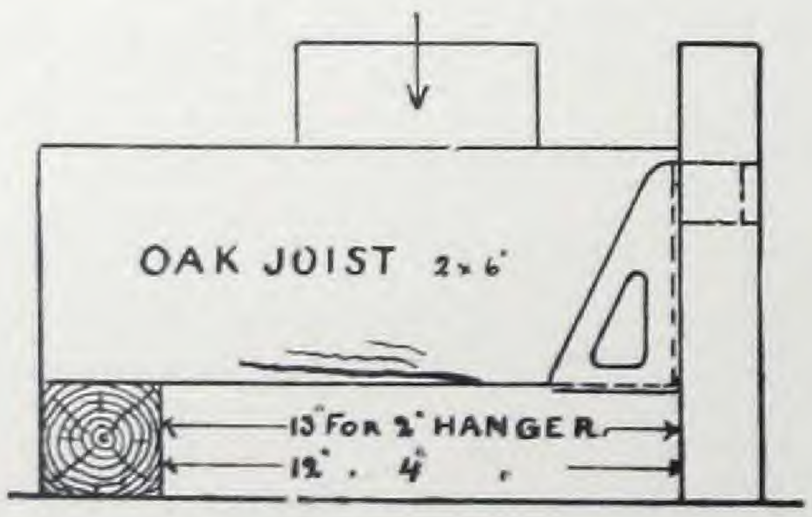
Test No. 1—A, 2 in. by 10 in. joist, 10 in. long. B and B, 2 in. by 10 in., 2 ft. 6 in. long with A framed in center. Ends of B and B supported on oak blocks D-D. C-C, 2 in. by 5 in., hanger framed in center of B. 1st strain 500 lbs., strain continued at intervals 500 lbs. up to 6,000 lbs., when hanger showed a settlement in hole of $\frac{1}{32}$ in.; on removing strain the hole in wood resumed its natural form. At 7,850 lbs. strain, wood showed signs of splitting in center of hole, and at 9,400 lbs. both joists badly split and showed a crush of $\frac{1}{8}$ in. in hole, which went back to $\frac{1}{16}$ in. after 4 days, the density of wood in hole under bearing having increased about one-half.

Test No. 2—Same as test No. 1, only the hangers C-C, were framed into joists B-B, one inch above the center. Strain ran up to 8,000 lbs., rest 10 minutes, when a slight split was observed, and the hanger crushed into hole about $\frac{1}{16}$ in., and at 9,000 lbs. joist split, at 10,000 lbs. badly split, and hanger crushed into wood $\frac{3}{16}$ in., which returned to $\frac{1}{8}$ in. scant after four days.





Test No. 3—A, Cast Iron Beam. B-B, Cast Iron Frame. C-C, Duplex Hanger, D-D, hole drilled for hanger. Total area of cross section of one hanger A—B—0.585 sq. in. Started test with a strain of 10,000 lbs. at 25,000 lbs. strain, permanent set; at 40,200 lbs. strain, slight shearing; at 43,800 lbs. strain, one hanger broke at C-C, the other started breaking around bottom of nipple. Stretch in body of hanger ¼ in. in 4½ in. Body of hanger does not show any rupture.



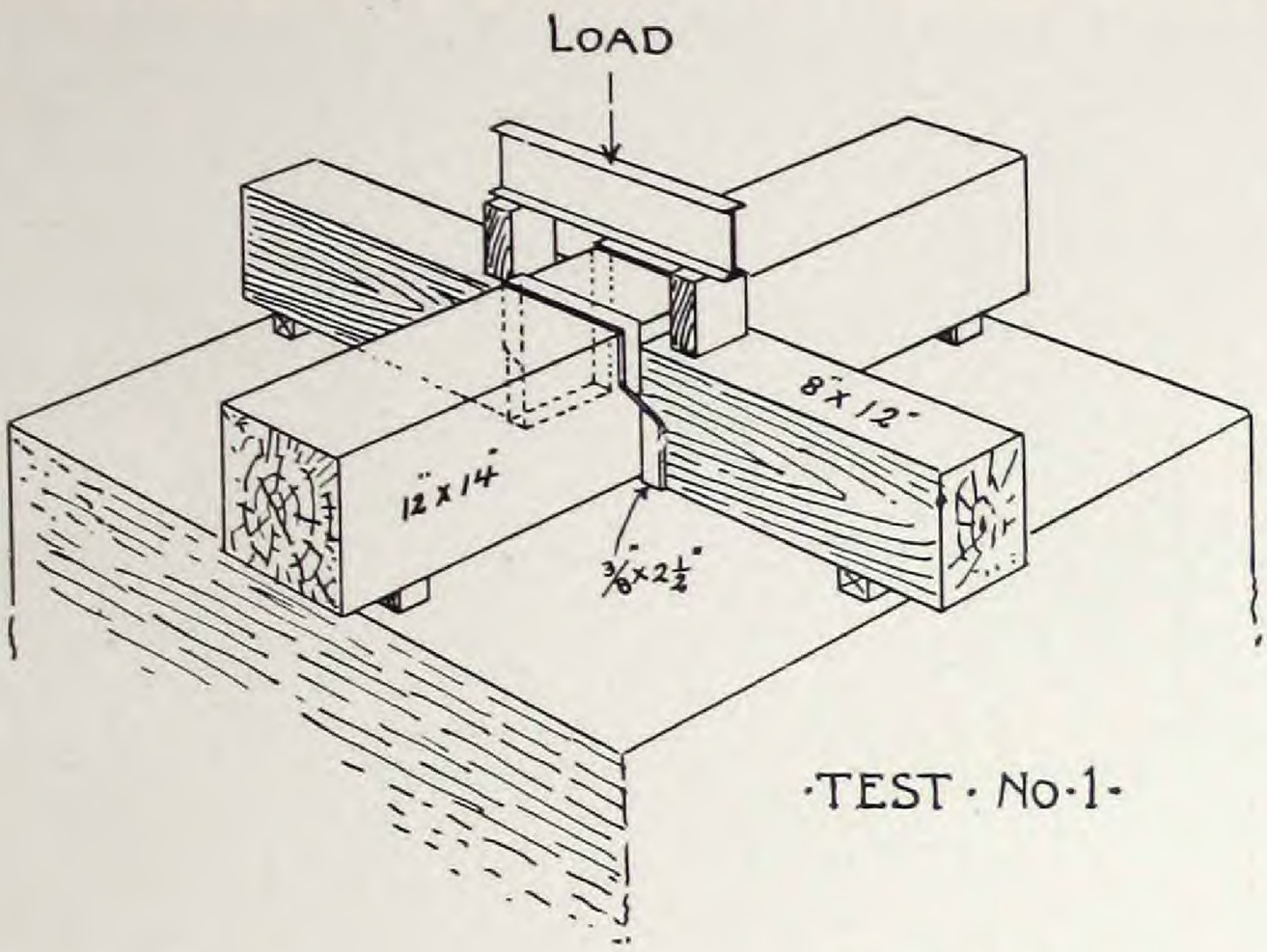
Test No. 4—This is to certify that two malleable iron hangers, received from the Duplex Hanger Co., were tested by us as shown in appended sketch. Weight applied vertically at middle of joist. 2 in. hanger, weight of 14,800 lbs. applied, joist broke under load. 4 in. hanger, weight of 16,300 lbs. applied. Oak upright crushed under boss of hanger. A slight fracture appeared under boss of bottom hangers, owing to bending due to crushing of timber, hangers otherwise O. K. after test.

This is to certify that tests described on sheets 1, 2 and 3, date of October 24th, accompanying this, were made on our Testing Machine and that above sheets are a correct report of tests.

OTIS IRON & STEEL CO.
G. B.

THE DUPLEX HANGER COMPANY

REPORT OF TESTS MADE AT THE OTIS STEEL CO., CLEVELAND, O.



NOVEMBER 9th, 1900.

Test No. 1

To a girder 12-in. x 14-in. were framed two 8-in. x 12-in. beams, hung in a 3/8-in. x 2½-in. double stirrup. The pressure was put on, and when 40,000 lbs. were applied, both beams began to break. At 57,650 lbs. the stirrup broke in one corner. The girder was compressed 5/16-in. where the stirrup was applied and the bottom of the stirrup bent 9/16-in.

Test No. 2

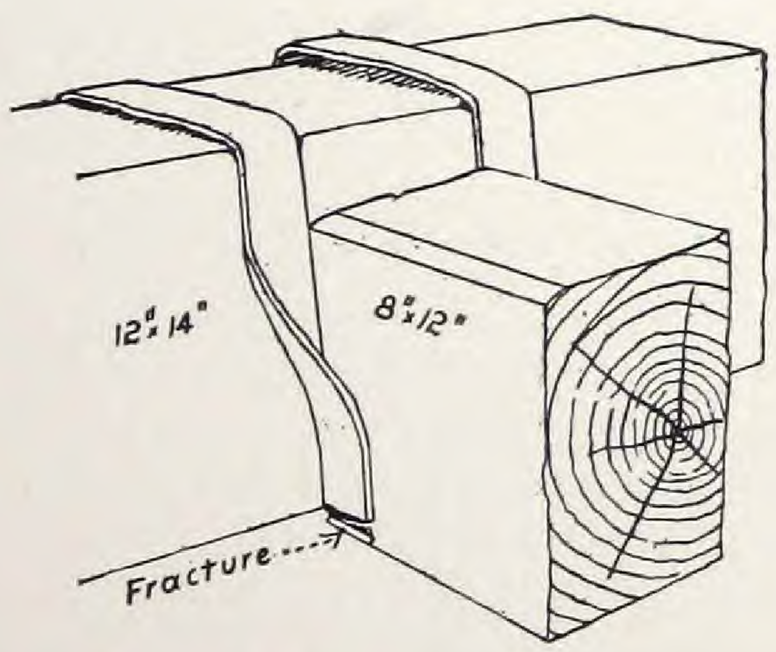
To a girder 12-in. x 14-in. were framed two 8-in. x 12-in. beams in No. 35 R. and L. Duplex Joist Hangers, bolted through the girder, but not bolted through the beams.

At 38,000 lbs. the beams began to break, and at 68,100 lbs. the beams were splintered so badly that no further test could be made. The Duplex Hangers were applied at the neutral axis, and after the test showed no sign of any strain. The girder was in perfect condition and there was no perceptible depression in the holes where the hangers were inserted.

The bearing blocks under the beam had been compressed 9/16-in. and 3/4-in. respectively, while the compression of the beams was 3¾-in. at the point where the weight was applied. The end of the beam measured 15¼-in. where it was splintered instead of 12-in. before the test. The above is a correct report of tests made by us.

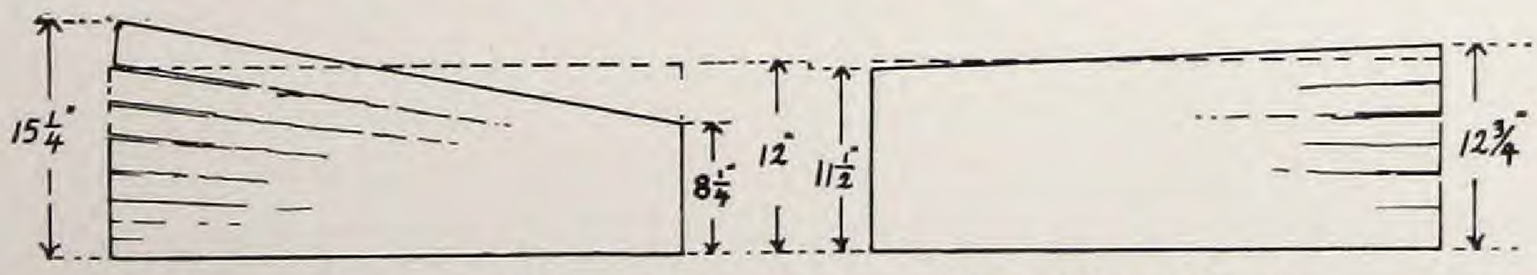
[Signed] THE OTIS STEEL CO.,

J. A. FITZGERALD, Eng. of Tests.



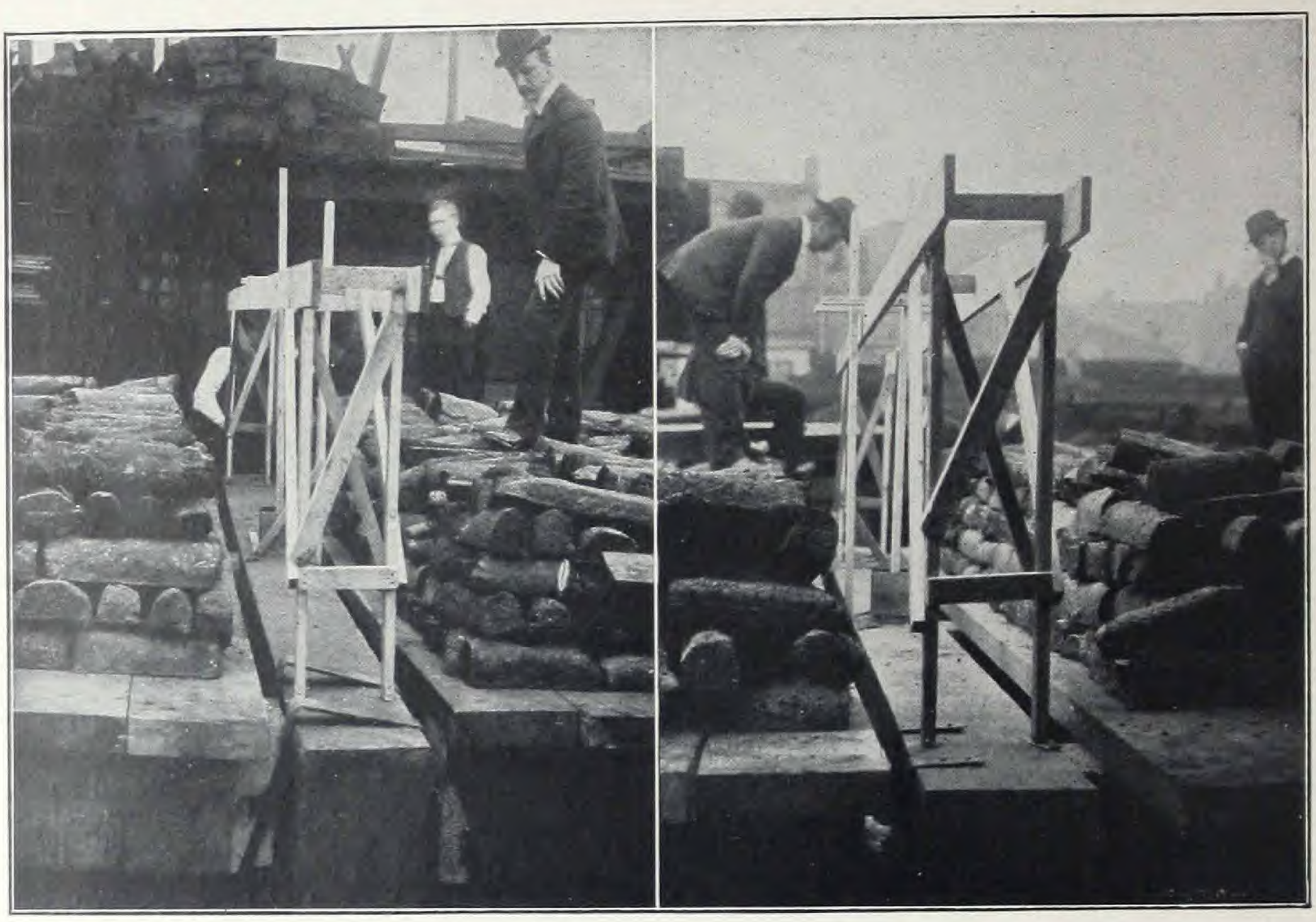
NOTE.—This cut shows the exact condition of the stirrup after test. The stirrup raised 1¼ in. above girder.

Stirrup broke at 57,650 lbs. Duplex Hanger in perfect condition at 68,100 lbs.



Condition of Timbers after Test No. 2 **After Test No. 1**

PHOTOGRAPHIC VIEWS OF TESTS MADE IN ST. LOUIS, MO.



St. Louis, Mo., April 17th, 1902.

Messrs. Mauran, Russell & Garden, Architects,
Chemical Building, City.

Gentlemen:—

I beg to submit the following report on tests of hangers made in the yards of the Union Iron Co., of this city, April 4th, 1902.

Warren A. Tyrell, Civil Engineer.

GENERAL DESCRIPTION

Two adjacent bays were framed with 12-in. x 16-in. yellow pine girders 17-ft. 0-in. on centers and 10-in. x 14-in. yellow pine beams 7-ft. 0-in. on centers, as shown on accompanying sketch. The girders were supported by 12-in. x 12-in. cast iron plates, 14-ft. 0-in. on centers, care being taken that the plates were free of the beams framing at the ends of the girders. Duplex Hangers were used at the points marked 1, 2, 3, 4, 5, 6, 10, 11, 12, with the centers of the spools about 10-in. from the bottom of the girder or 2-in. above the neutral axis. At the point marked 7, a wrought iron stirrup of 3 x ⅜ iron was used, at 8, a Cleveland Hanger, and at 9, a Van Dorn Hanger. 3-in. planking was laid parallel to the girders and clearing the middle girder by 3-in. The floor was loaded with pig iron over an area of 8-ft. 0-in. x 14-ft 0-in. as shown on accompanying sketch and photographs. The deflection of the middle girder was read upon completion of each layer. Upon the failure of wrought iron and steel hangers, the loading was confined to an area of 7-ft. 0-in. x 8-ft. 0-in. at the middle of the North Bay and adjacent to the middle girder (shown in dotted lines on sketch). The loading was continued until six o'clock, and the load was allowed to remain over night and removed the following day, the deflection being read as the load was removed.

RESULTS, THE WROUGHT IRON STIRRUPS, NO. 7

Began to fail very early by crushing down on the near side, rising on the far side. When three layers were completed or under a load of about 3,500 pounds, it had crushed into the wood about ⅛ inch, and had risen 1 inch on the other side when four and a half layers were on, or under a load of about 5,000 pounds the beam was blocked up, the condition of the hanger being shown in photograph attached.

THE VAN DORN HANGER NO. 9

Crushed down the wood at the near side and rose about ¾ inch at the ends under its final load of 5,500. Shown in photograph.

THE CLEVELAND HANGER NO. 8

Began to bend at the edge of the girder crushing down the fibres, and, when the fourth layer was complete, it had crushed in so as to be flush on top with the edge of the girder, the ends rising slightly, load 14,700 pounds. When the fifth layer was complete, or under a load of 18,300 pounds, there was a well defined crack between the notches, and running a few inches on both sides. The girder was badly crushed at the edge, as shown in photograph.

DUPLEX NO. 5

There were no signs of failure of the Duplex Hangers at No. 5 until layer No. 8, 27,300 pounds, was complete, when a slight crack was developed in the girder between the spools, and extending a short distance on both sides. Under the final load of 38,000 pounds on this hanger, this crack had increased slightly in length and width, the washers on the far side having sunk about ⅛ inch into the timber. The conditions of the girder, beam, hanger and bolts, after the test, are shown in the accompanying photo. The bolt running through the beam was bent considerably. The beam was crushed about ⅛ inch where it rested on the hanger. The hanger was uninjured. Deflection on center girder 0.95 inch. After removal of load 0.05 inch. The total load on this bay was 72,000 pounds.

St. Louis, Mo., April 14th, 1902.

The Duplex Hanger Co., Cleveland, Ohio.

Gentlemen:—We take great pleasure in giving you the assurance that we consider the recent test made between Duplex Hangers, Van Dorn Hangers, Cleveland Hangers and Stirrups, as the most thorough proof of the great superiority of your Duplex Hangers. Inasmuch as the test was made entirely under the supervision of Mr. Tyrell, civil engineer, that the conditions for all hangers tested were precisely the same, we are convinced that no preference was shown to any single device.

Having been present, we could not help but see that the Duplex Hangers certainly stood the test most admirably, and gladly state that the test was only suspended because we considered it impossible to break the Duplex Hangers. From the photographs of the test and the figures as given by Mr. Tyrell, we fully agree that the Duplex Hangers were loaded with seven times the weight suspended by the stirrups and the steel hangers, when the latter gave out, while at that point, the Duplex Hangers were perfectly intact. The test being made under the exact conditions that are usual in erecting a heavy mill construction building and being a very exhaustive one, we consider it to be of great value to all parties who are interested in the erection of buildings where heavy mill construction is to be used.

We, whose names appear herewith, were present at the test and gladly certify to the correctness of same.

Chas. K. Ramsey,
Alfred M. Baker,
M. P. McArdle,
Jacob Seidel,
E. C. Kleiveisen,
Ernest J. Hess,
Albert O. Clark,
A. Blair Reddington.

REPORT OF TEST MADE AT BALTIMORE, MD., AUGUST 24th, 1904, UNDER THE SUPERVISION OF THE BUILDING INSPECTOR

A TEST was ordered for the purpose of determining what action the boring of holes for framing Duplex Hangers in close proximity would have on the headers.

Three 3-in. x 12-in. joists 12 feet long were spiked together for headers. The headers were supported by wooden posts 12-in. above the ground. To these were framed 10 joists 16 feet long every 12-in. on centers. The joists were hung in Steel Stirrups 3/8-in. x 2-in. on one end and in Duplex Hangers No. 21 on the other end. Over the joists planking was laid parallel to the headers, about 6-in. from the headers so as to leave the joist hangers and stirrups in full view. The platform was then loaded with brick. After a uniform load of 300 pounds per square foot had been applied, the stirrups began crushing into the header and raising on the far side. When a load of 500 pounds per square foot had been placed on the platform, the Duplex Hangers were perfectly intact. No sign of failure could be detected on the header where these hangers were framed in, while the stirrups had raised considerable and had crushed into the header from 5/8-in. to 3/4-in., practically failing.

The load being nearly three times the safe load allowed for this construction, the inspector ordered the test stopped and gave permission to use Duplex Hangers on all work. The 3-in. x 12-in. joists showed considerable deflection, showing that the ultimate safe load for these joists had been reached. It was found that the inner joist of the header on which the stirrups had been hung had been crushed down so much that it projected 3/8-in. below the lower surface of the other two joists which formed part of the header. The header on which Duplex Hangers had been framed, was examined after the load had been removed, and no sign of failure or splitting of the wood could be detected.

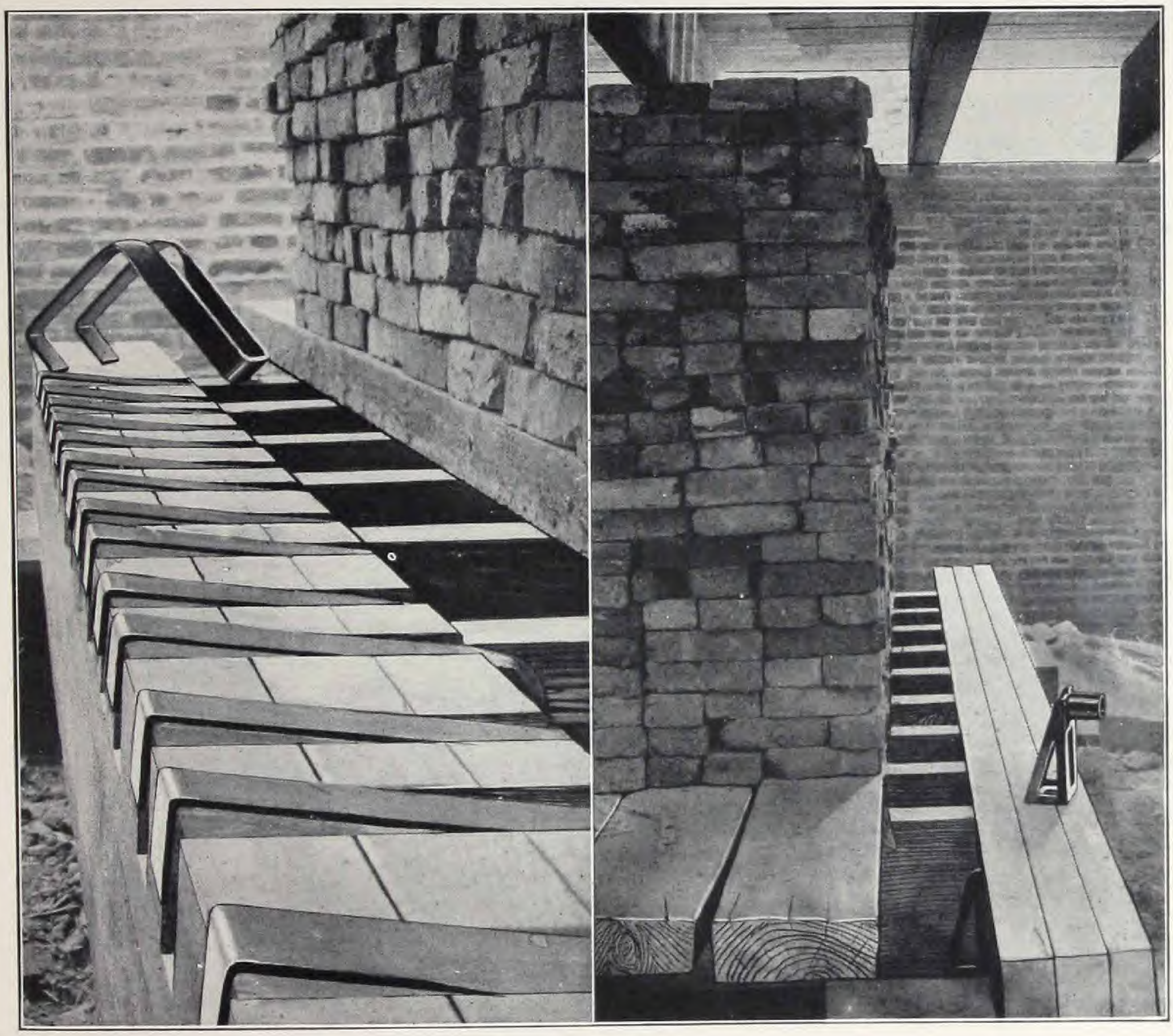
We, the following, are witnesses of the test:

JOHN HINES, Foreman of building where test was made.
RICHARD FRAZIER, Builder.
EDWARD BRADY, JR., Builder.
MORGAN MARSHALL, of Jno. Marshall & Son, Builders.
J. E. STANFIELD, Builder.
JOHN STACK & SON, Builders.

CHAS. McCAULEY.

WILLIAM C. SCHNABLE, *Supt.*

See page 55 for photographic views of this test.



Photographic View of Baltimore Test Showing the Duplex Hangers and Stirrups

The photograph taken of the test shows conclusively that the Duplex Hangers were perfectly intact. After the load was removed the header was examined and no sign of crushing in the header was detected. Upon close examination of the holes in which the hanger had been placed, it was found that the bearing of the nipple of the hanger extended uniformly throughout the lower half of the hole. The load was 500 lbs. per sq. ft., which is four times the safe load for which this construction is usually figured.

The photograph of the stirrups shows plainly how they raised on the far side of the header, and how the stirrup crushed into the inner edge.

Save Money on Insurance

DUPLEX Post Caps and DUPLEX Wall Hangers reduce your Insurance Rates.

REPORTS OF FIRE TEST

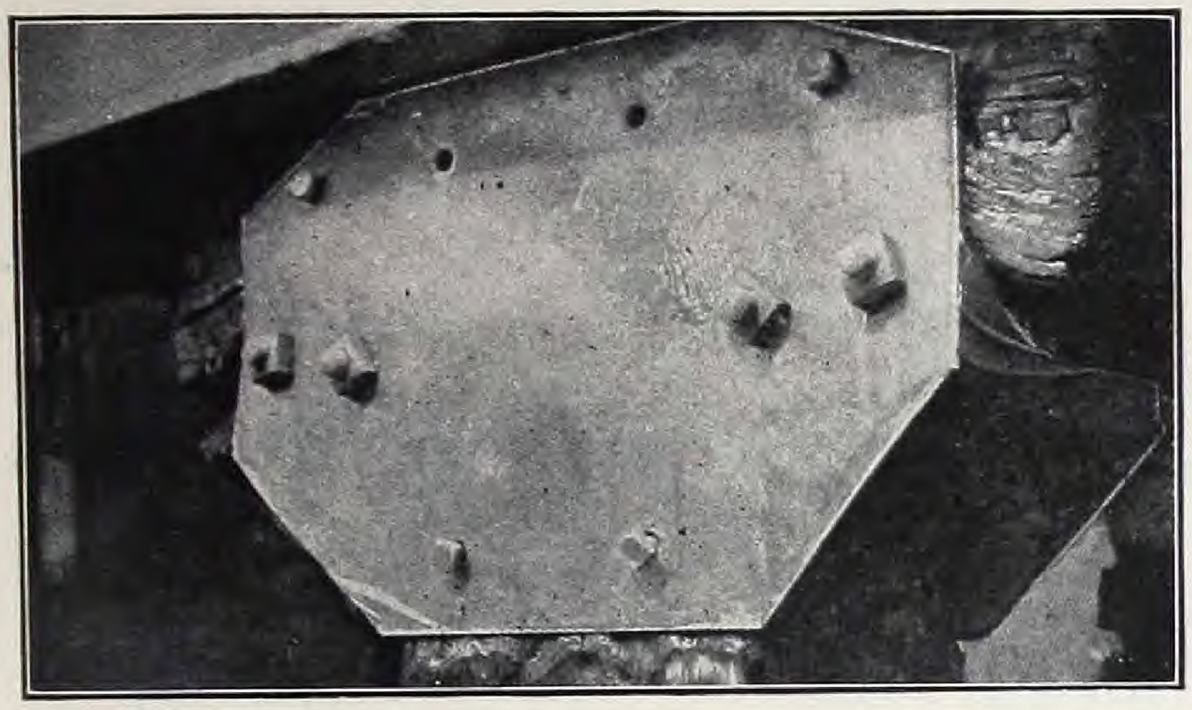
On DUPLEX Extra Heavy Wall Hangers, DUPLEX Steel Post Caps and DUPLEX Malleable Iron Post Caps No. 1, made by the Underwriters' Laboratories, Chicago, Ill., Feb. 10th, 1909, under the direction of The National Board of Fire Underwriters:

Test No. 1

Two Duplex Steel Wall Hangers, No. 1,200, extra heavy, were framed to cast iron blocks, one end resting upon each of the cast iron blocks, as shown in the accompanying photograph.

12 x 12 beams were framed into the Hangers and test applied, same as shown in illustration of Tests on Duplex Post Caps. A load of 46,900 lbs. was placed on the Hangers before the Fire Test began. The Hangers were subjected to a maximum temperature of 1,250 degrees, and the duration of the test was thirty minutes.

The accompanying photograph shows the exact condition of the Hangers after the Fire Test. The Hangers held the load perfectly. As a result of this test, the Hangers were approved by the National Board of Fire Underwriters. We are furnishing Extra Heavy Duplex Steel Wall Hangers with the Underwriters' Official Label, facsimile of which is given above, showing that the same have been inspected and approved.



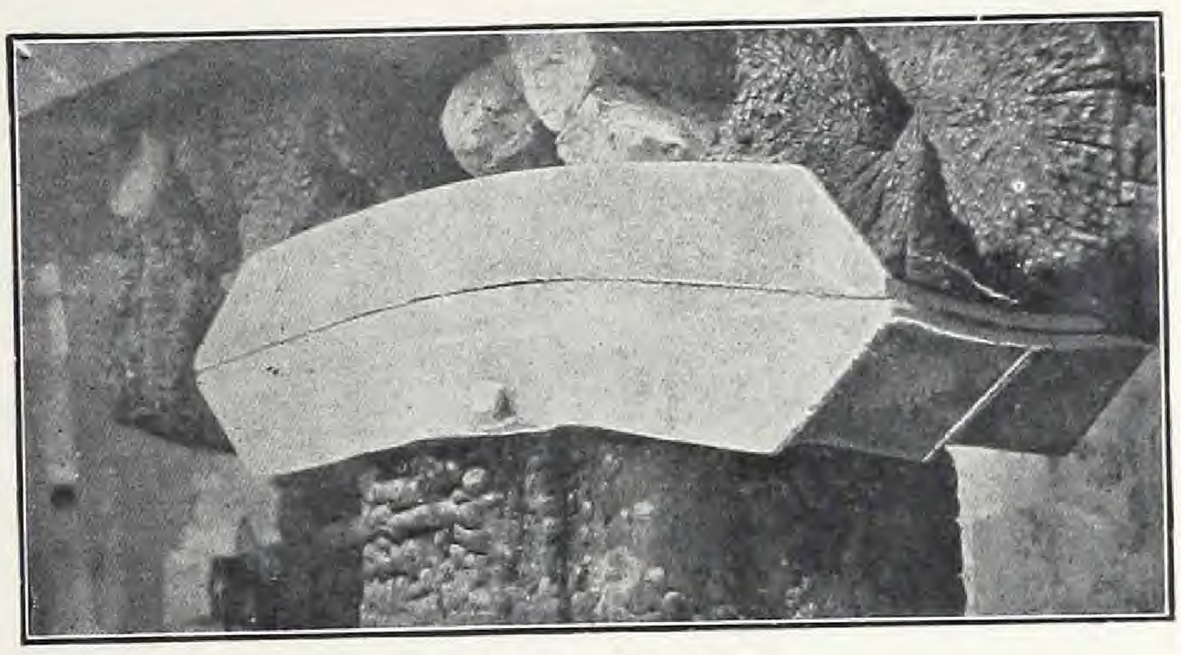
Test No. 2

A Duplex Steel Post Cap for 12 x 12 Post was placed on a Post 12 x 12 and two blocks 12 x 12 were framed into the Cap. The Cap was placed in position on Testing Machine, as shown in illustration. A load of 46,900 lbs. was placed upon the Cap before the Fire Test started. The Cap was subjected to a maximum temperature of over 1,400 degrees, and the accompanying photograph shows the exact condition of the Cap after the Test.

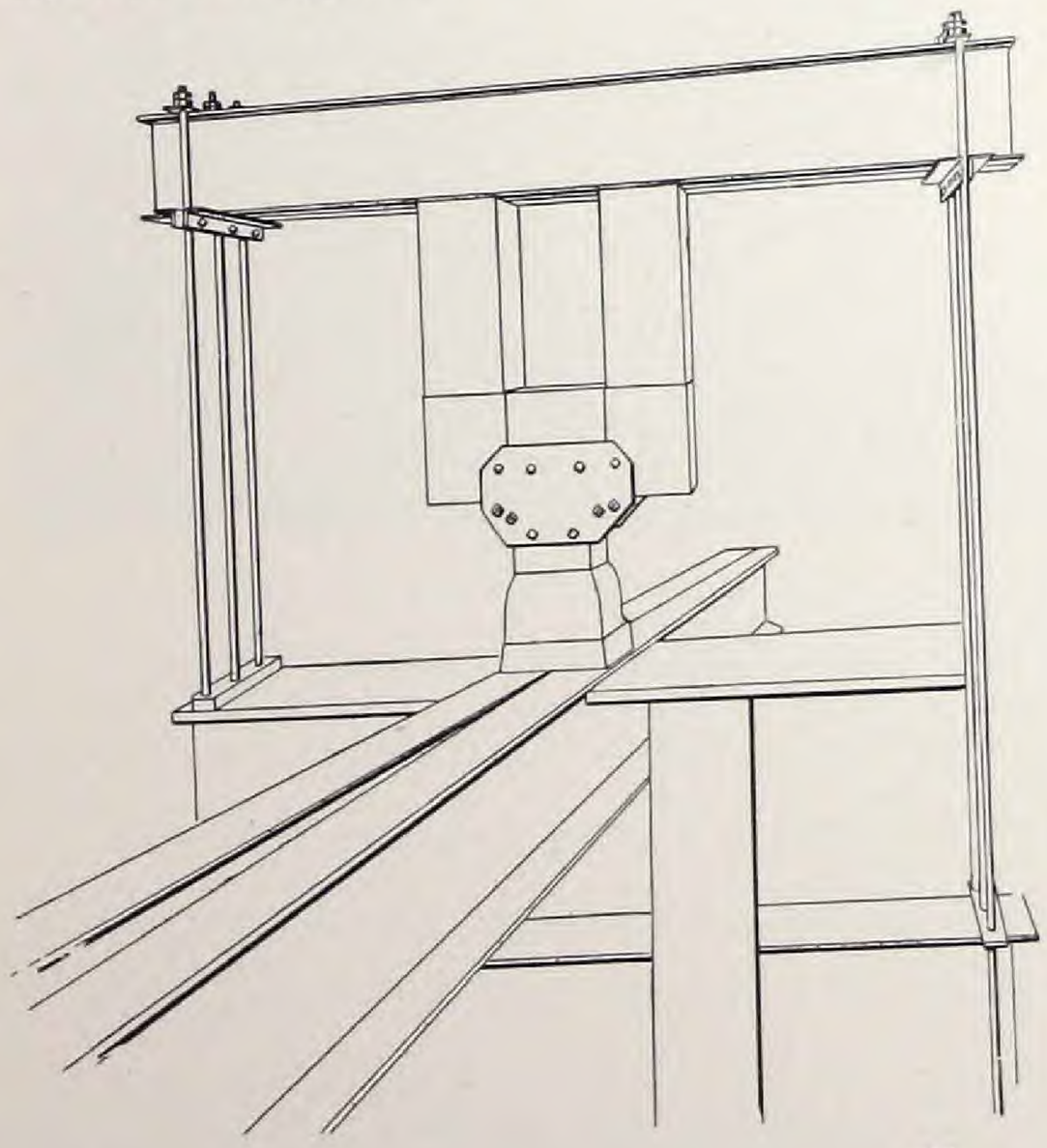
The Cap held the load perfectly, and as a result of the Test, was approved by the National Board of Fire Underwriters. We are furnishing these Caps with the Underwriters' Official Label, showing that same have been inspected and approved.

A Duplex Malleable Iron Post Cap, No. 1, for 12 x 12 Post, was placed on a Post 12 x 12, and two blocks 12 x 12 were framed into the Cap. The Cap was placed in position on Testing Machine, as shown in the illustration. A load of 46,900 lbs. was placed upon the Cap before the Fire Test started. The Cap was subjected to a maximum temperature of over 1,600 degrees, and the accompanying photograph shows the exact condition of the Cap after the test.

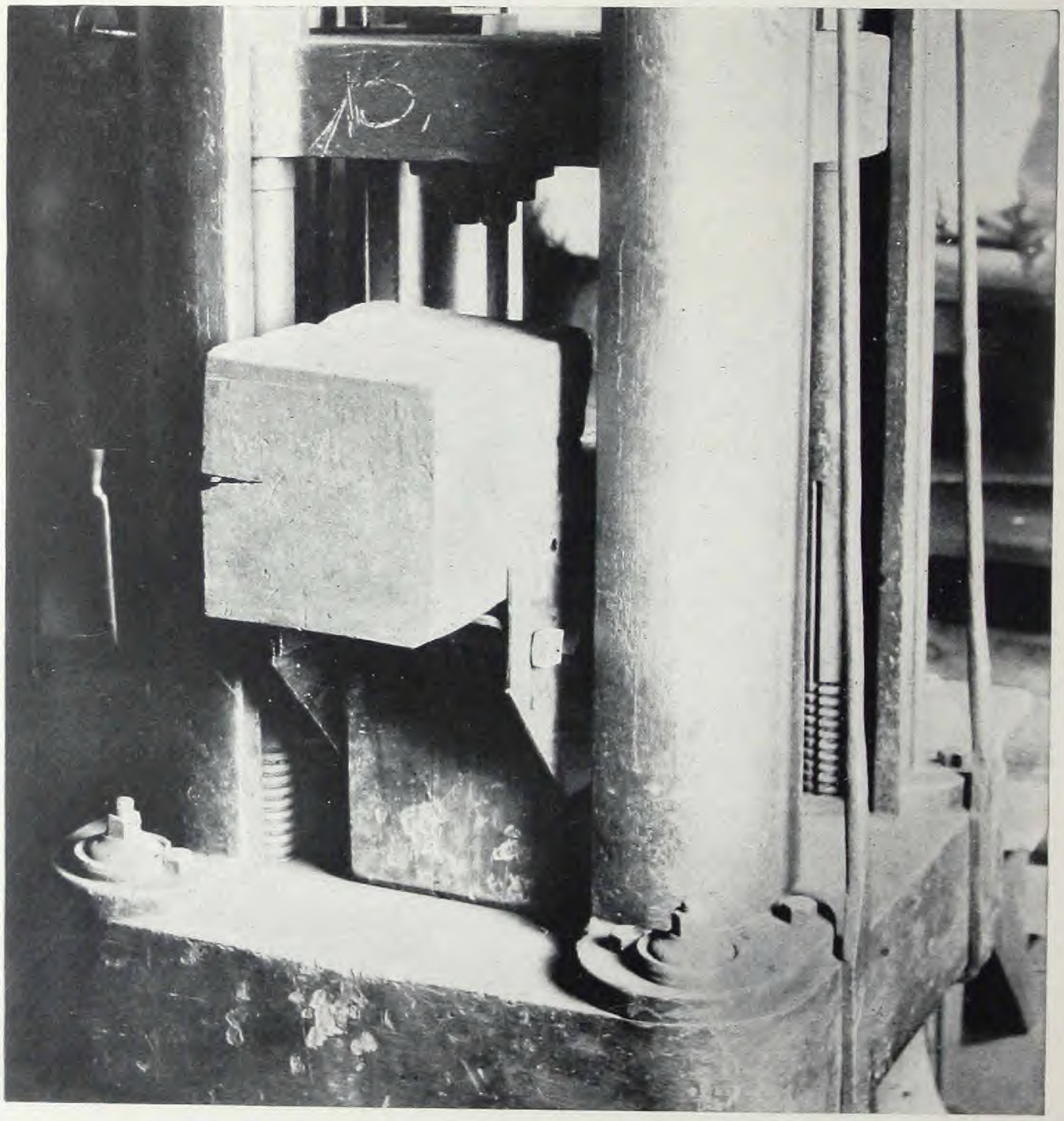
The Cap held the load perfectly, and as the result of the Test was approved by the National Board of Fire Underwriters. We are furnishing these Caps with the Underwriters' Official Label, showing that same have been inspected and approved.



Test No. 3



This entire test apparatus was enclosed within a brick structure, so as to test under actual fire conditions.



Photograph of Testing Machine at Otis Steel Co., Cleveland, Ohio,
Showing Method of Testing Post Cap

THE DUPLEX HANGER COMPANY

BRIDGES AND VIADUCTS,
BUILDINGS AND ROOFS,
STRUCTURAL WORK,
ELECTRIC RAILWAYS,
WATER WORKS.

GENERAL CONSULTATION,
REPORTS,
SUPERINTENDENCE,
INSPECTION,
ESTIMATES AND DESIGNS.

CHAS. F. LEWIS,
CONSULTING CIVIL ENGINEER,
404 THE OSBORN.

TELS. { OFFICE, BELL NORTH 859.
RES., BELL EAST 771-L.

CLEVELAND, O. July 10, 1907

REPORT OF TESTS made upon

DUPLEX POST CAPS at OTIS STEEL CO. Ltd.

A Duplex Steel Post Cap made up of two side plates and one bearing bracket, all being made of 1/4" open hearth steel plates bolted together with 4 bolts 3/4" diameter, was placed on a wooden post 12" X 12" by 18" high. Two wooden blocks 12" X 12" were placed on the bearing bracket leaving a space in the center of the post cap 12" X 12" so as to allow for upper post. Two steel plates were placed upon the two blocks, then a steel "I" beam was placed across so as to distribute the weight of the testing machine uniformly on both sides or ends of the post cap.
At 125,000 lbs. the blocks crushed very badly and the "I" beam buckled. The test was, therefore, stopped; the wooden blocks were removed and solid steel blocks 5" X 5" X 12" wide were placed on each end of the bearing bracket and the weight was applied directly on these blocks. At 175,000 lbs. the limit of the Testing Machine was reached. The post cap was thoroughly examined by us, and as shown on photograph attached hereto, showed but a slight deflection in the bearing bracket-amounting to less than 1/4" at the outer edge. All the bolts, as well as the side plates, were in perfect condition, and the post cap showed no sign of failure.

Test upon DUPLEX MALLEABLE IRON POST CAP # 2. for 10" X 10" Post.

A Malleable Iron Post Cap was placed on top of a 10" X 10" post 12" high. Two 5" X 5" steel blocks 10" wide were placed on the post cap leaving a clear space 10" X 10" for upper post. The weight was applied directly on the steel blocks. At 140,000 lbs. the cap began bending down at the outer edge and raised in the center. At 168,000 lbs. the test was suspended the cap showing a deflection of 5/16" at the outer edge while the center had been raised 3/8". The cap did not show a sign of fracture.

Condition of post cap after test shown on accompaning photograph.

J. A. Fitzgerald
Engineer of Tests Otis Steel Co. Ltd.

Chas. F. Lewis.
Consulting Engineer

THE DUPLEX HANGER COMPANY

The Otis Steel Company, Limited.

Telephone "North 209

G. Bartol, Genl. Manager.
H. F. Doverell, Secretary.

Cleveland, Ohio.

September 9, 1909.

We made to-day a test of your DUPLEX Post Cap, consisting of a lower part made of malleable iron and upper part made of steel channel, for a 10X10 Post to carry 10" Girders.

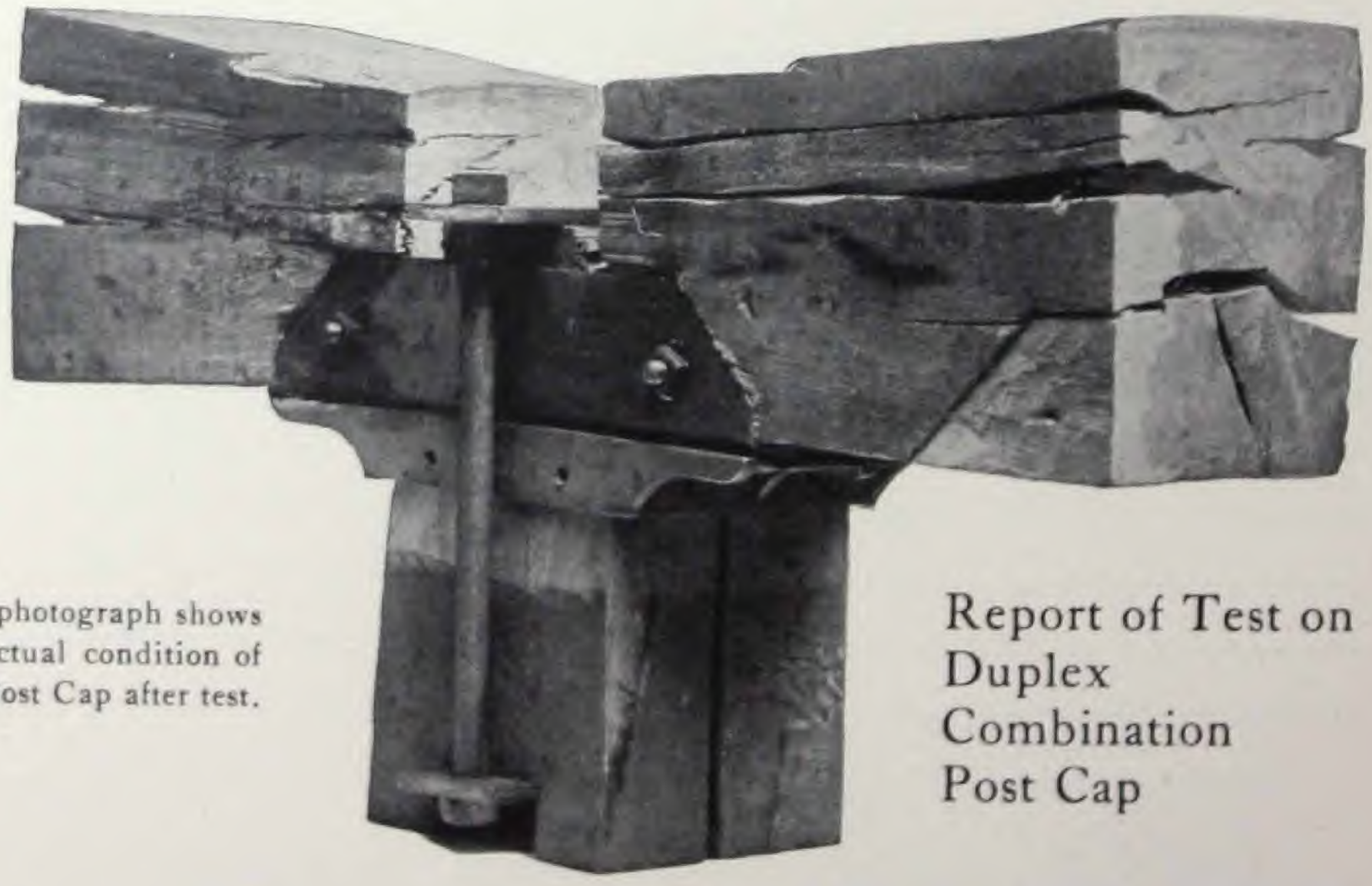
The Cap was placed upon a 10X10 block, and two pieces of timber 10X10 were placed at the outer edge of the Post Cap, the timbers having 5" bearing on the Cap.

The following data give the results obtained from the tests made:

When a load of 40,000 lbs. was applied on the wooden blocks, the wood began to crush at the point where the testing blocks were applied, and when 60,000 lbs. were reached, the outer end of the 10X10 timbers opened up considerable. At 95,000 lbs., the timbers were compressed 3-$\frac{1}{2}$", bringing the testing block almost to the top of the Cap. The timbers had opened up over 5-$\frac{1}{2}$" at the outer edge.

The timbers having practically failed, the test was suspended. The Cap was examined and found to be in perfect condition, a slight deflection on the outer edge, being no more than $\frac{1}{8}$ of an inch in the center of the Cap, was noticed.

J. A. Fitzgerald
Engineer of Tests, Otis Steel Co. Ltd.



This photograph shows actual condition of Post Cap after test.

Report of Test on Duplex Combination Post Cap

THE DUPLEX HANGER COMPANY

ALL ORDERS ARE ACCEPTED SUBJECT TO DELAYS BROUGHT ABOUT BY ACCIDENTS, STRIKES FIRES OR CAUSES BEYOND OUR CONTROL
ALL QUOTATIONS ARE MADE FOR IMMEDIATE ACCEPTANCE ONLY AND SUBJECT TO CHANGE WITHOUT NOTICE

The Otis Steel Company, Limited.

Telephone "North 209"

G. Bartol, Genl. Manager.
H. F. Deverell, Secretary.

Cleveland, Ohio.

September 6, 1906.

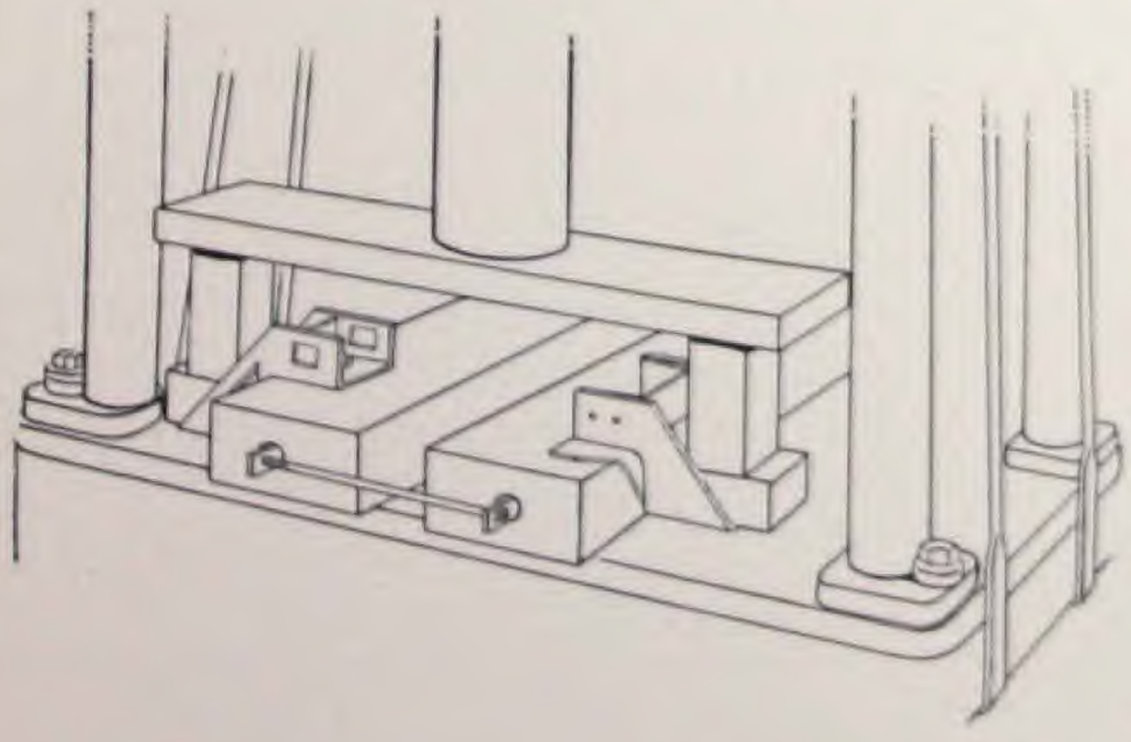
Test Made For The Duplex Hanger Co.

On March 15th, we made a test at our works of two Duplex Wall Hangers No. 1200 Extra Heavy, one being made out of steel plates reinforced with steel angle , the other being a malleable iron casting. These two hangers were framed opposite each other and placed on heavy cast iron blocks and fastened thereto with bolts, so as to be absolutely rigid. These two hangers were placed 24" apart. In the hangers were placed an I-Beam so as to distribute the weight of the testing machine uniformly on both hangers. After a weight of 145,000 lbs. had been applied on the two hangers, the malleable iron hanger gave way at the lower plate, while the steel hanger was perfectly in-tact. The weight was removed, the hangers taken out andexamined and no defect was found in the steel hanger.

Yours Very truly,

J. A. Fitzgerald

Engineer of Tests Otis Steel Co. Ltd.



Test on Duplex Extra Heavy
Wall Hangers

Photograph of Test on Four No. 9 Concrete Block Joist Hangers Made for Mr. F. W. Hagloch, Consulting Engineer on Concrete Construction

CLEVELAND, O., December 20, 1905.

The Duplex Hanger Co.,

Williamson Building, City.

Gentlemen:

I have closely inspected the test of four No. 9 Duplex Hangers supporting two joists 2-in. x 12-in. x 12 feet on which was placed a load of 14,600 lbs., and while the joists deflected two and thirteen-sixteenths of an inch, the hangers remained on the blocks and held the ends of the joists intact.

The fact that no mortar was used, thus allowing the hangers to shift under the strain, and that they gave no sign of doing so, is certainly remarkable and clearly demonstrated the superior qualities of your malleable cast hanger over wrought iron hangers.

In my building practice I find your hanger to meet all requirements and have not found one inferior hanger, which is certainly gratifying after having had much trouble with the continual settling common to wrought iron (strap) hangers. I wish to thank you for the trouble you have taken in making this test for me, and remain,

Most truly yours, FRED W. HAGLOCH.

THE DUPLEX HANGER COMPANY

Telegraphic Code

Ship at once by freight: **RESULT.** Ship at once by express: **RELY.**

For the convenience of our customers who wish to wire their orders we have compiled the following code. By the use of it a considerable saving in telegraphic charges is made.

For instance: "Send today by express, 200 No. 14 Joist Hangers, seventy No. 140 Wall Hangers, twelve Post Caps ten by ten," can be put in the following short message: "Rely two hundred table, seventy tent twelve tongue."

Duplex Post Cap

6 x 6 Post Cap to carry 6-inch girder	Toast
6 x 6 Post Cap to carry 8-inch girder 1-inch offset	Tort
6 x 6 Post Cap to carry 10-inch girder 2-inch offset	Tory
8 x 8 Post Cap to carry 8-inch girder	Toil
8 x 8 Post Cap to carry 10-inch girder 1-inch offset	Toss
8 x 8 Post Cap to carry 12-inch girder 2-inch offset	Totter
10 x 10 Post Cap to carry 10-inch girder	Tongue
10 x 10 Post Cap to carry 12-inch girder 1-inch offset	Touch
10 x 10 Post Cap to carry 14-inch girder 2-inch offset	Tourist
12 x 12 Post Cap to carry 12-inch girder	Tower
12 x 12 Post Cap to carry 14-inch girder 1-inch offset	Toward
12 x 12 Post Cap to carry 16-inch girder 2-inch offset	Torpor
14 x 14 Post Cap to carry 14-inch girder	Top
14 x 14 Post Cap to carry 16-inch girder 1-inch offset	Topple
14 x 14 Post Cap to carry 18-inch girder 2-inch offset	Topaz
16 x 16 Post Cap to carry 16-inch girder	Trumpet
16 x 16 Post Cap to carry 18-inch girder 1-inch offset	Truant
16 x 16 Post Cap to carry 20-inch girder 2-inch offset	Trudge
18 x 18 Post Cap to carry 18-inch girder	Total
20 x 20 Post Cap to carry 20-inch girder	Topic

Duplex Malleable Iron Post Cap No. 1

6 x 6 Post Cap to carry 6-inch girder	Habit
6 x 6 Post Cap to carry 8-inch girder 1-inch offset	Hack
6 x 6 Post Cap to carry 10-inch girder 2-inch offset	Hag
8 x 8 Post Cap to carry 8-inch girder	Hat
8 x 8 Post Cap to carry 10-inch girder 1-inch offset	Hair
8 x 8 Post Cap to carry 12-inch girder 2-inch offset	Hale
10 x 10 Post Cap to carry 10-inch girder	Half
10 x 10 Post Cap to carry 12-inch girder 1-inch offset	Hall
10 x 10 Post Cap to carry 14-inch girder 2-inch offset	Hallow
12 x 12 Post Cap to carry 12-inch girder	Halter
12 x 12 Post Cap to carry 14-inch girder 1-inch offset	Ham
12 x 12 Post Cap to carry 16-inch girder 2-inch offset	Hammer
14 x 14 Post Cap to carry 14-inch girder	Hand
14 x 14 Post Cap to carry 16-inch girder 1-inch offset	Handful
14 x 14 Post Cap to carry 18-inch girder 2-inch offset	Handbook
16 x 16 Post Cap to carry 16-inch girder	Handsome
16 x 16 Post Cap to carry 18-inch girder 1-inch offset	Happy
16 x 16 Post Cap to carry 20-inch girder 2-inch offset	Harbor

Duplex Combination Post Caps

6 x 6 for 6-inch girder		Campus
6 x 6 for 8-inch girder	1-inch offset	Calico
6 x 6 for 10-inch girder	2-inch offset	Calcium
8 x 8 for 8-inch girder		Caliber
8 x 8 for 6-inch girder	1-inch bent in	Camel
8 x 8 for 10-inch girder	1-inch offset	Canary
8 x 8 for 12-inch girder	2-inch offset	Cunard
10 x 10 for 10-inch girder		Candy
10 x 10 for 8-inch girder	1-inch bent in	Cane
10 x 10 for 6-inch girder	2-inch bent in	Cannon
10 x 10 for 12-inch girder	1-inch offset	Canopy
10 x 10 for 14-inch girder	2-inch offset	Canoes
12 x 12 for 12-inch girder		Capital
12 x 12 for 10-inch girder	1-inch bent in	Captain
12 x 12 for 8-inch girder	2-inch bent in	Captive
12 x 12 for 14-inch girder	1-inch offset	Cardinal
12 x 12 for 16-inch girder	2-inch offset	Careful
14 x 14 for 14-inch girder		Carriage
14 x 14 for 12-inch girder	1-inch bent in	Casement
14 x 14 for 10-inch girder	2-inch bent in	Casting
14 x 14 for 16-inch girder	1-inch offset	Catch

Wall Tie

Lot 100 Wall Tie	Lamp	Lot 113 Wall Tie	Letter
Lot 101 Wall Tie	Luster	Lot 120 Wall Tie	Less
Lot 102 Wall Tie	Loose	Lot 121 Wall Tie	Lazy
Lot 103 Wall Tie	Long	Lot 122 Wall Tie	Leak
Lot 110 Wall Tie	Lizard	Lot 123 Wall Tie	Laugh
Lot 111 Wall Tie	Light	Lot 200 Wall Tie	Lawn
Lot 112 Wall Tie	Line	Lot 300 Wall Tie	Last

Duplex Wall Boxes

6 x 10	Soap	12 x 14	Something
6 x 12	Sober	12 x 16	Song
6 x 14	Social	12 x 18	Sonnet
6 x 16	Socket	12 x 20	Soon
8 x 10	Soft	14 x 14	South
8 x 12	Soda	14 x 16	Sordid
8 x 14	Solar	14 x 18	Sorrow
8 x 16	Soldier	14 x 20	Soul
8 x 18	Solo	16 x 16	Sound
10 x 12	Solemn	16 x 18	Soup
10 x 14	Solicitor	16 x 20	Southern
10 x 16	Solitary	16 x 22	Souvenir
10 x 18	Solution	18 x 18	Space
10 x 20	Solvent	18 x 20	Span
12 x 12	Somber	18 x 22	Spark

Joist Hangers

No. 10	Joist Hangers	Tab
No. 14	Joist Hangers	Table
No. 15	Joist Hangers	Tack
No. 16	Joist Hangers	Tall
No. 18	Joist Hangers	Talent
No. 20	Joist Hangers	Taffy
No. 21	Joist Hangers	Tank
No. 21X	Joist Hangers	Temper
No. 28	Joist Hangers	Tramp
No. 28X	Joist Hangers	Teller
No. 53	Joist Hangers	Tardy
No. 53X	Joist Hangers	Tariff
No. 60	Joist Hangers	Task
No. 60X	Joist Hangers	Trot
No. 80	Joist Hangers	Teacher
No. 90	Joist Hangers	Tea
No. 91	Joist Hangers	Technic
No. 92	Joist Hangers	Teetotal
No. 93	Joist Hangers	Teaspoon
No. 25 R. & L.	Joist Hangers	Tenant
No. 35 R. & L.	Joist Hangers	Team
No. 75 R. & L.	Joist Hangers	Tooth
No. 77 R. & L.	Joist Hangers	Toothache

Wall Hangers

No. 100 Wall Hangers	Tunnel
No. 140 Wall Hangers	Tent
No. 180 Wall Hangers	Tumor
No. 150 Wall Hangers	Tumbler
No. 200 Wall Hangers	Tulip
No. 210 Wall Hangers	Term
No. 280 Wall Hangers	Terror
No. 500 Wall Hangers	Test
No. 600 Wall Hangers	Thanks
No. 800 Wall Hangers	Theater
No. 1000 Wall Hangers	Thief

Extra Heavy Wall Hangers

No. 600 Wall Hangers	Thin
No. 800 Wall Hangers	Thirst
No. 1000 Wall Hangers	Thistle
No. 1200 Wall Hangers	Thorn
No. 1400 Wall Hangers	Throat
No. 1600 Wall Hangers	Thumb
No. 1800 Wall Hangers	Thumping

Duplex Concrete Block Hangers

No. 9 Concrete Hanger	Lumber
No. 11 Concrete Hanger	Loyal
No. 13 Concrete Hanger	Locket

I-Beam Hangers

No. 2 I-Beam Hangers	Thunder
No. 2½ I-Beam Hangers	Trick
No. 3 I-Beam Hangers	Ticket
No. 4 I-Beam Hangers	Tie
No. 5 I-Beam Hangers	Till
No. 6 I-Beam Hangers	Tip
No. 7 R.L., I-Beam Hangers	Time

Duplex Malleable Iron Post Cap No. 2

For 6 x 6 Post	Human
For 8 x 8 Post	Humble
For 10 x 10 Post	Humbug
For 12 x 12 Post	Humming
For 14 x 14 Post	Hungry

Duplex Malleable Iron Wall Plate

For 6-inch Beams	Silver
For 8-inch Beams	Signal
For 10-inch Beams	Silk
For 12-inch Beams	Sinking
For 14-inch Beams	Sipping
For 16-inch Beams	Similar
For 18-inch Beams	Sitting

Post Bases

6 x 6 Post Bases	Town
8 x 8 Post Bases	Tragic
10 x 10 Post Bases	Traitor
12 x 12 Post Bases	Trap
14 x 14 Post Bases	Travel
16 x 16 Post Bases	Treat
18 x 18 Post Bases	Trifle

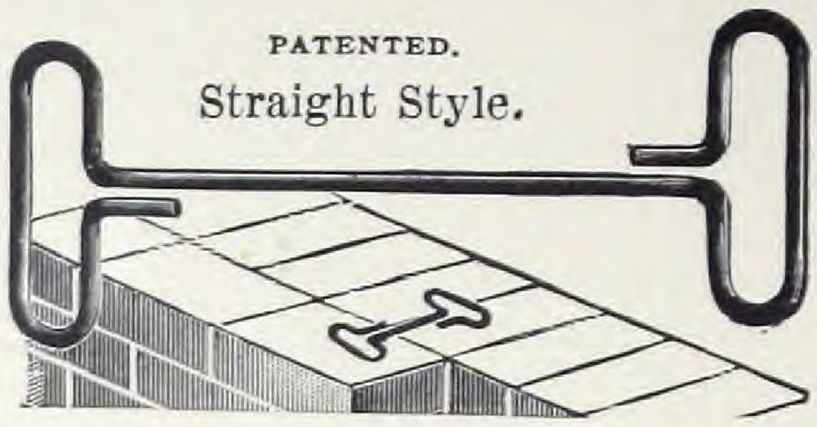
THE DUPLEX HANGER COMPANY

THE CLEVELAND STEEL WALL TIE

For Bonding Terra Cotta and Pressed Brick Facings to Common Brick Back.

PATENTED.

Straight Style.



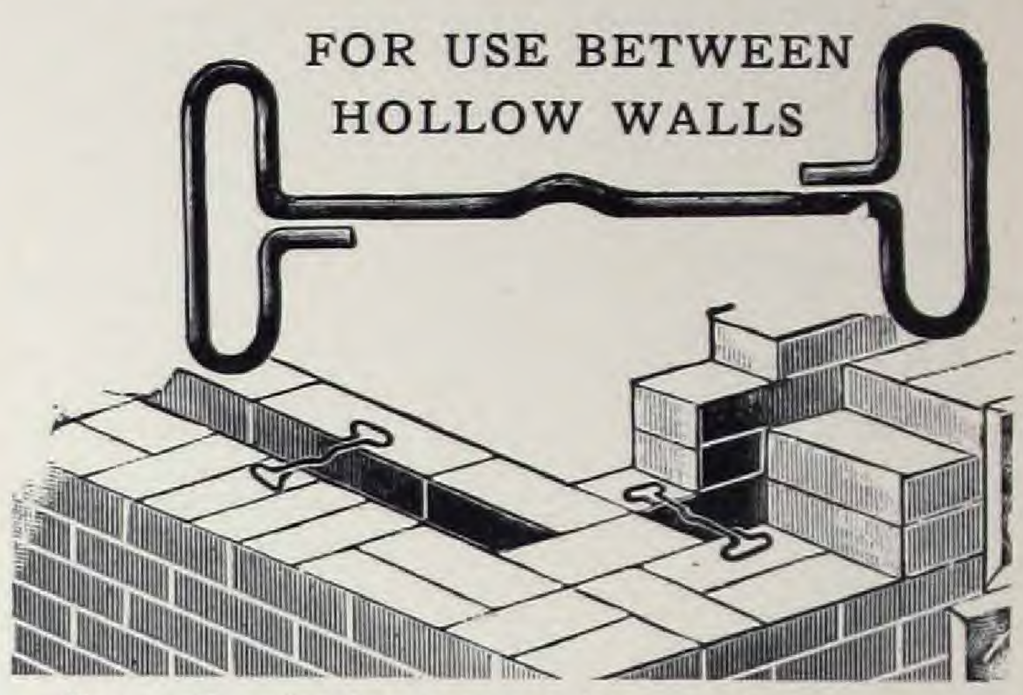
Has displaced the old method of diagonal Brick Bonding. It is **better and cheaper** than any other substitute.

Endorsed by leading architects and contractors.

Lot No.	List Price
90—No. 9 Gauge	$10.00
100—6½ Straight Steel Wall Ties 5-32, per 1000	15.00

For 3-16 Galvanized Steel Wire add 50 cents net per 1000.

FOR USE BETWEEN HOLLOW WALLS

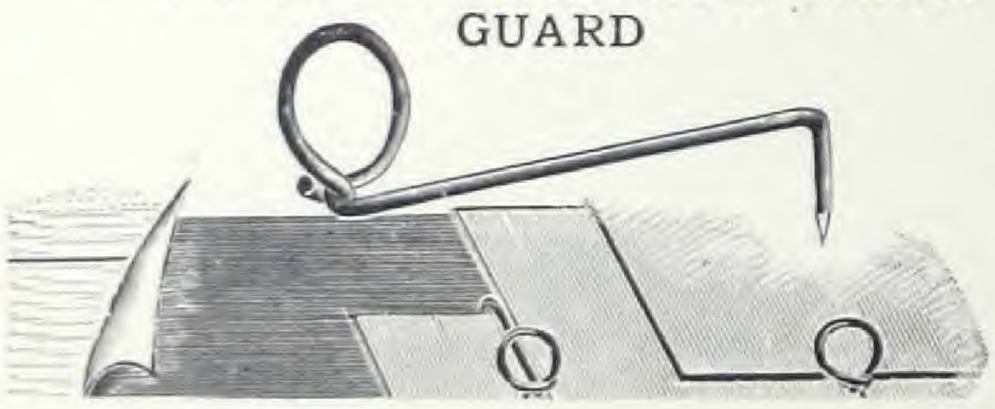


For effectively preventing moisture or dampness, we make the Cleveland Steel Wall Tie with a drip.

Lot No.	List Price
110—6½ Steel Wall Ties with Drip 5-32, per 1000	$16.50

We also manufacture these designs in the following lengths: 8½ inches, 11½ inches, 15½ inches.

THE CLEVELAND WIRE SNOW GUARD



Lot No.	List Price
127—Wire Snow Guards, per 1000	$15.00
128—Copper Snow Guards. Price on application.	

CORRUGATED WALL TIES

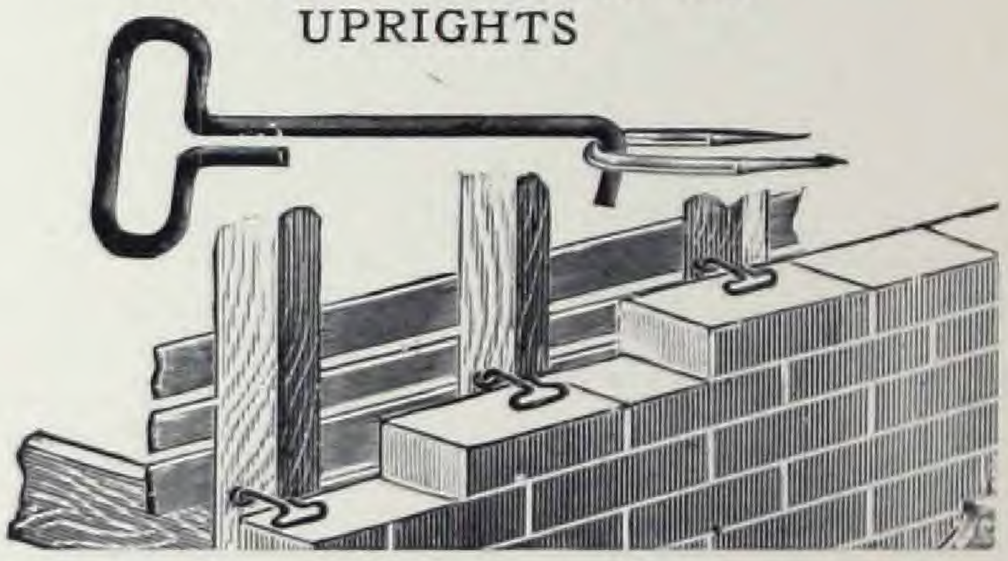
Acknowledged as the **best Flat Wall Tie** on the market. The **deep** corrugations firmly grip the mortar on both sides and make a perfect bond.

For a cheap Wall Tie it has no equal in price or effectiveness.

Can be used wherever a Wall Tie is required.

Lot No.	List Price
200—6½-inch Flat Galvanized Metal Corrugated Wall Ties, per 1000	$5.00

FOR VENEER WORK—STRAIGHT STYLE FASTENED TO UPRIGHTS



Four Inch Ties should be used on every fourth course where air space exists and **Three and One-Half Inch Ties** in every fifth course in all other cases.

This tie is also made **with Drip** for use **between Brick and Sheathing** with air space.

For repair work to be used to bond new work to old or rebuilding facings for fire places, etc.

For Veneer Style

Lot No.			List Price
120—4	Straight,	per 1000	$15.00
121—4	Drip,	"	16.00
122—4½	Repair Work,	"	15.00
123—6½	Repair Work,	"	17.00

WALL TIES FOR GOVERNMENT WORK

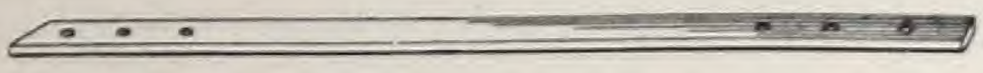
14 Gauge

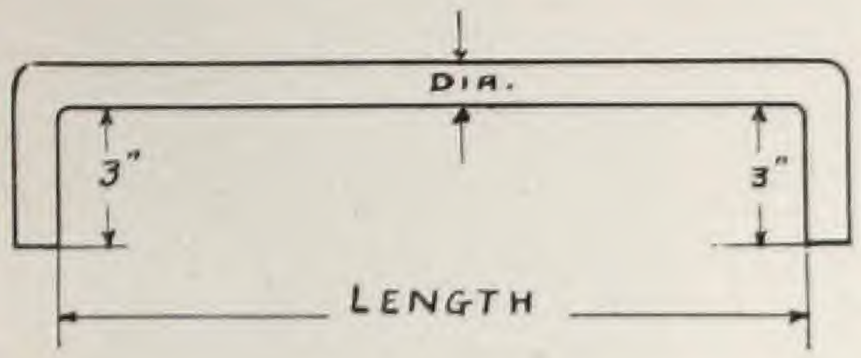
Specifications—Flat steel, 1-inch wide, galvanized after holes are punched. Length, 8 to 18 inches. Prices upon application.

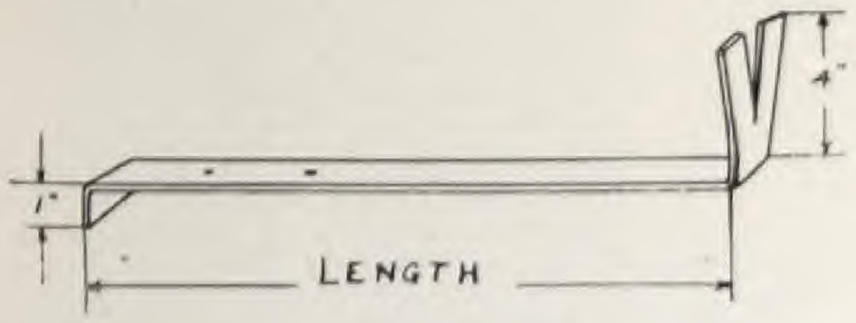
WRITE FOR DISCOUNT

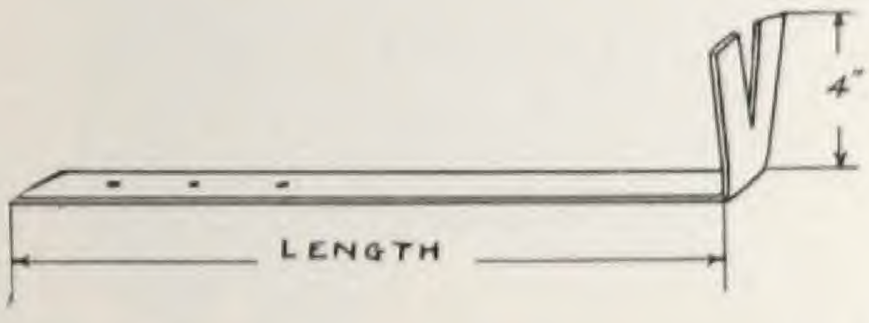
Building Anchors--Any special sizes made to order on short notice

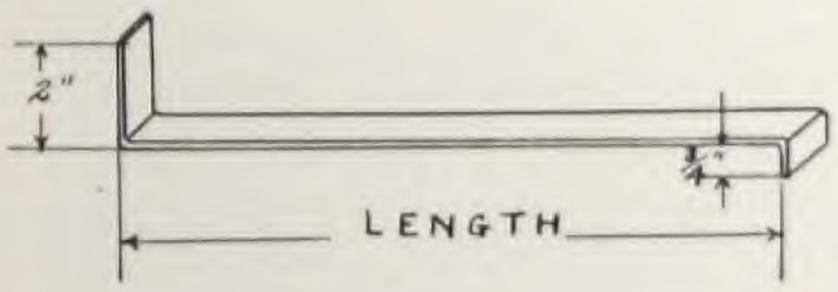
Flat Straps Anchors with three spike holes in each end:

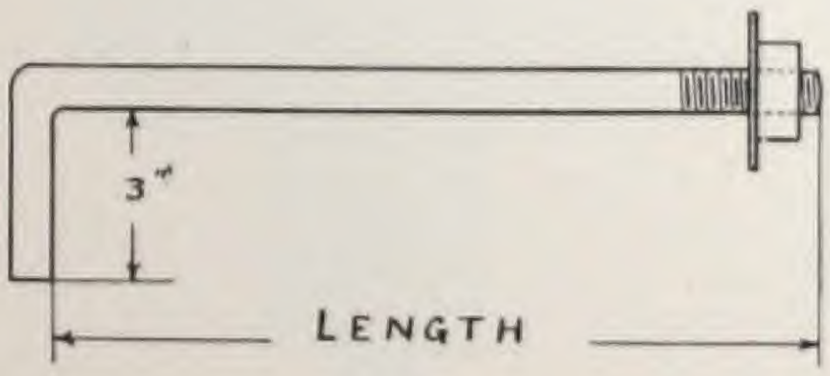


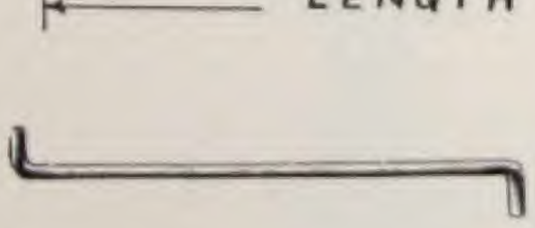












No.	Size	Length	Price Each
1	1½x¼	18-in.	$ .18
2	1½x¼	21-in.	.21
3	1½x¼	24-in.	.24
4	2 x¼	18-in.	.24
5	2 x¼	24-in.	.30
6	2 x¼	30-in.	.36
	Timber Dogs:		
7	⅝-in.	18-in.	$ .14
8	⅝-in.	20-in.	.18
9	¾-in.	20-in.	.26
10	¾-in.	24-in.	.32
11	¾-in.	30-in.	.40
12	1 -in.	30-in.	.58
	Standard Split Anchors, one end turned up and one down:		
15	1 x¼	18-in.	$ .16
16	1½x¼	12-in.	.18
17	2 x¼	16-in.	.30
18	2 x¼	18-in.	.34
19	2 x¼	20-in.	.38
20	2 x¼	24-in.	.44
21	2 x⅜	36-in.	.70
	Split Anchors, one end turned up:		
22	2 x¼	18-in.	$ .30
23	2 x¼	24-in.	.36
24	2 x¼	30-in.	.42
	Wall Anchors, one end turned up:		
25	1½x¼	18-in.	$ .20
26	1½x¼	21-in.	.24
27	2 x¼	18-in.	.30
28	2 x¼	24-in.	.36
29	2 x¼	30-in.	.42
	Stone Anchors:		
30	1 x⅛	6-in.	$ .08
31	1 x⅛	8-in.	.10
32	1 x⅛	10-in.	.12
33	1 x⅛	12-in.	.14
	Plate Bolts—Wall Anchors:		
34	⅝-in. round	12-in.	$ .40
35	¾-in. round	18-in.	.52
36	¾-in. round	24-in.	.60
37	¾-in. round	30-in.	.70
	Galvanized Wall Anchors:		Per 1000
139	⅜" x 8"		$25.00
141	⅜"x10"		27.00
142	⅜"x12"		29.00
143	⅜"x14"		31.00
144	⅜"x16"		33.00
145	⅜" x 8"		42.00
146	⅜"x10"		44.00
147	⅜"x12"		46.00
148	⅜"x14"		48.00
149	⅜"x16"		50.00

Wrought Iron Wall Anchors: 25 per cent. less than galvanized anchors.

T-Wall Anchors:

39	1½x¼	24-in.	$ .30

WRITE FOR DISCOUNT.

THE DUPLEX HANGER COMPANY

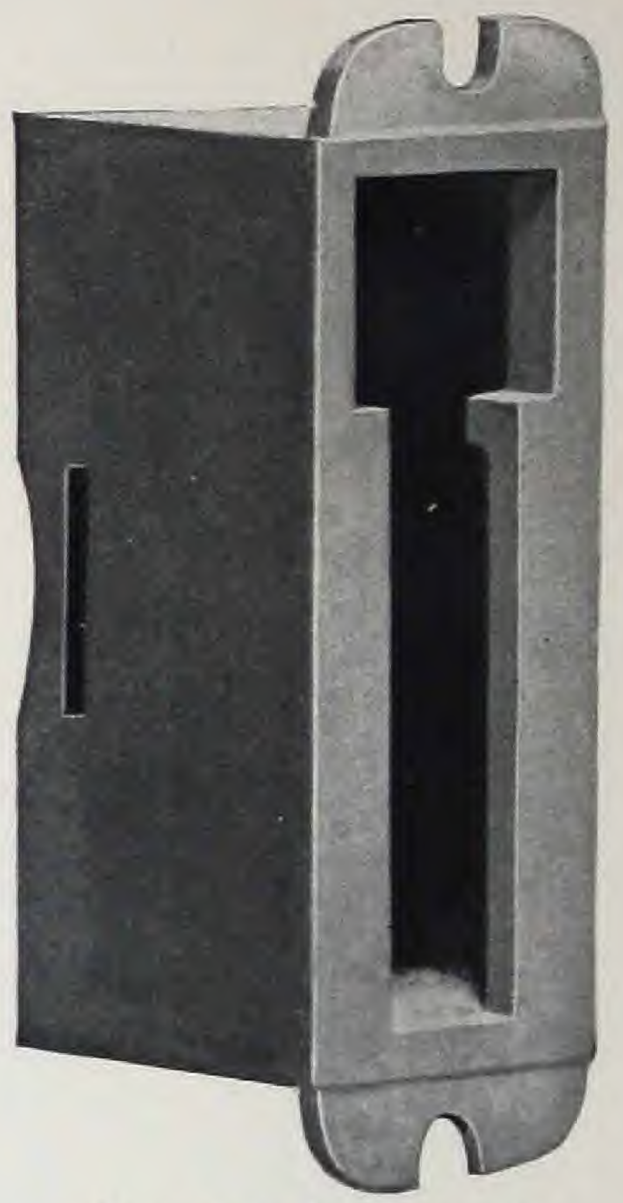
THE DUPLEX CONCRETE INSERTS

FOR REINFORCED CONCRETE BUILDINGS

Avoid expensive cutting in concrete work. The Duplex inserts are used for attaching and hanging shafting, machinery and fixtures from concrete. Easily placed and very satisfactory.

The Duplex Adjustable Insert (with slot)

Made for 3/8, 1/2, 5/8 and 3/4 inch bolts.



Showing Bottom of Adjustable Insert

PRICE LIST.

Duplex Adjustable Insert for 3/8 and 1/2 inch bolt..... .....$ .15
Duplex Adjustable Insert for 5/8 inch bolt..... .20
Duplex Adjustable Insert for 3/4 inch bolt..... .25

For Use in Concrete Floor Slabs

Height of Hanger, 3½ inches.
Length of Arm, 6 in., 9 in., 12 in.
Tapped for 5/8 in., 3/4 in., 7/8 in. bolts.

For use in Girders and Beams

The Duplex Pipe Hanger

Height, 2½ in. over all. Size of plate 2x3 in.
Tapped for 3/8 and 1/2 inch bolts.

The Duplex Pipe Hanger Insert can be used where light fixtures, wires, etc., are carried.

PRICE LIST.

Duplex Pipe Hanger Insert.....$ .15

Duplex Socket Shaft Hanger

The Duplex Socket Insert is used where no adjustment is desired. Used for hanging weights, heavy fixtures, etc.

PRICE LIST.

Duplex Socket Insert, including straps.$ .30

WRITE FOR DISCOUNT.

THE DUPLEX HANGER COMPANY

PRICE LIST

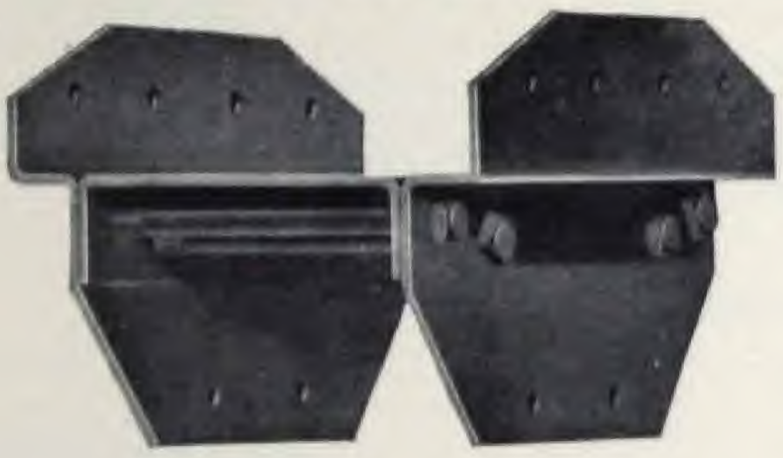
DUPLEX STEEL POST CAPS

6x 6	to carry	6-in.	Girder	$ 3.00
8x 8	" "	8-in.	"	4.00
10x10	" "	10-in.	"	5.00
12x12	" "	12-in.	"	6.00
14x14	" "	14-in.	"	8.00
16x16	" "	16-in.	"	10.00
18x18	" "	18-in.	"	16.00
20x20	" "	20-in.	"	20.00

DUPLEX STEEL POST CAPS

Offset to Carry Larger Girders than Post

Bent Out Side Plates



6x 6	to carry	8-in	Girder	$3.50
6x 6	" "	10-in.	"	4.00
8x 8	" "	10-in.	"	4.50
8x 8	" "	12-in.	"	5.00
10x10	" "	12-in.	"	5.50
10x10	" "	14-in.	"	6.00
12x12	" "	14-in.	"	7.00
12x12	" "	16-in.	"	8.00
14x14	" "	16-in.	"	9.00
14x14	" "	18-in.	"	10.00
16x16	" "	18-in.	"	12.00
16x16	" "	20-in.	"	14.00
18x18	" "	20-in.	"	18.00

DUPLEX STEEL POST CAPS

Bent In to Carry Smaller Girders than Post

Bent In Side Plates

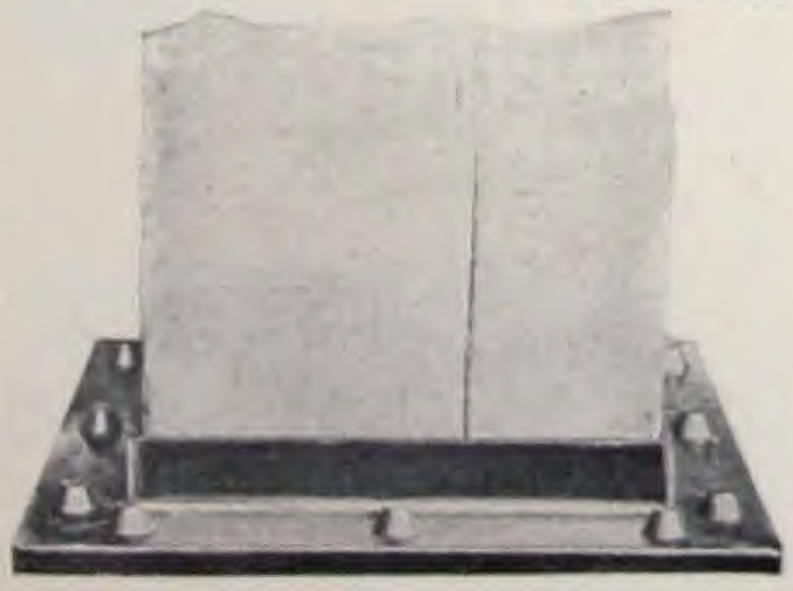
8x 8	to carry	6-in.	Girder	$4.50
10x10	" "	6-in.	"	5.00
10x10	" "	8-in.	"	5.50
12x12	" "	8-in.	"	7.00
12x12	" "	10-in.	"	7.00
14x14	" "	10-in.	"	9.00
14x14	" "	12-in.	"	9.00
16x16	" "	12-in.	"	12.00
16x16	" "	14-in.	"	12.00
18x18	" "	16-in.	"	18.00

For Post Caps of odd size Posts, such as 8 x 10, 10 x 12, and 12 x 14, etc., figure regular sizes of the larger dimension.

For Three-Way Post Caps add 25% additional.

For Four-Way Post Caps add 50% additional.

DUPLEX STEEL POST BASES

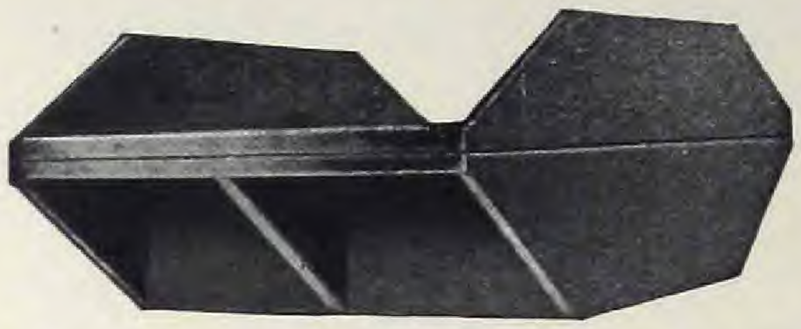


6 x 6	Post	$ 1.50
8 x 8	"	2.00
10 x 10	"	2.50
12 x 12	"	3.00
14 x 14	"	5.00
16 x 16	"	10.00
18 x 18	"	12.00
20 x 20	"	16.00

WRITE FOR DISCOUNT.

THE DUPLEX HANGER COMPANY

PRICE LIST



DUPLEX MALLEABLE IRON POST CAPS NO. 1

6 x 6	Post, two way to carry		6-in.	girder			$ 3.00
6 x 6	" " " " "		8-in.	"	1-in.	offset	3.50
6 x 6	" " " " "		10-in.	"	2-in.	"	4.00
8 x 8	" " " " "		8-in.	"			4.00
8 x 8	" " " " "		10-in.	"	1-in.	offset	4.50
8 x 8	" " " " "		12-in.	"	2-in.	"	5.00
10 x 10	" " " " "		10-in.	"			5.00
10 x 10	" " " " "		12-in.	"	1-in.	offset	5.50
10 x 10	" " " " "		14-in.	"	2-in.	"	6.00
12 x 12	" " " " "		12-in.	"			6.00
12 x 12	" " " " "		14-in.	"	1-in.	offset	7.00
12 x 12	" " " " "		16-in.	"	2-in.	"	8.00
14 x 14	" " " " "		14-in.	"			8.00
14 x 14	" " " " "		16-in.	"	1-in.	offset	9.00
14 x 14	" " " " "		18-in.	"	2-in.	"	10.00
16 x 16	" " " " "		16-in.	"			10.00

DUPLEX MALLEABLE IRON POST CAPS NO. 2

6 x 6	post	$2.00
8 x 8	"	2.75
10 x 10	"	3.50
12 x 12	"	4.00
14 x 14	"	5.00

DUPLEX COMBINATION POST CAPS

25 per cent. additional for three-way Post Caps. 50 per cent. additional for four-way Post Caps.

6 x 6	Post	6-in.	Girder		$2.50
8 x 8	"	8-in.	"		3.00
8 x 8	"	10-in.	"	1-in. offset	3.50
8 x 8	"	12-in.	"	2-in. "	4.00
10 x 10	"	10-in.	"		4.00
10 x 10	"	12-in.	"	1-in. offset	4.50
10 x 10	"	14-in.	"	2-in. "	5.00
12 x 12	"	12-in.	"		5.00
12 x 12	"	14-in.	"	1-in. offset	5.50
12 x 12	"	16-in.	"	2-in. "	6.00
14 x 14	"	14-in.	"		6.00
14 x 14	"	16-in.	"	1-in. offset	7.00

DUPLEX WALL BOXES

Size of Girder	Price Each	Cover Extra	Size of Girder	Price Each	Cover Extra
6 x 10....	$1.80	$ .10	12 x 12....	$4.00	$ .30
6 x 12....	2.00	.10	12 x 14....	4.40	.30
6 x 14....	2.20	.10	12 x 16....	4.80	.30
6 x 16....	2.40	.10	12 x 18....	5.20	.30
6 x 18....	2.80	.10	12 x 20....	5.60	.30
8 x 10....	2.10	.15	14 x 14....	5.00	.35
8 x 12....	2.30	.15	14 x 16....	5.40	.35
8 x 14....	2.50	.15	14 x 18....	5.80	.35
8 x 16....	2.70	.15	14 x 20....	6.20	.35
8 x 18....	3.20	.15	16 x 16....	5.80	.40
10 x 12....	3.40	.20	16 x 18....	6.20	.40
10 x 14....	3.70	.20	16 x 20....	6.60	.40
10 x 16....	4.00	.20	18 x 18....	7.00	.50
10 x 18....	4.30	.20	18 x 20....	7.50	.50
10 x 20....	4.60	.20			

WRITE FOR DISCOUNT.

THE DUPLEX HANGER COMPANY

PRICE LIST

DUPLEX WALL HANGERS

No. 100	to carry	Joist	2	x 6 to 2	x 12 $ .25
No. 140	"	"	" 2	x 14 to 2	x 18 .40
No. 180	"	"	" 2½	x 6 to 2½	x 16 .50
No. 150	"	"	" 3	x 6 to 3	x 10 .35
No. 210	"	"	" 3	x 12 to 3	x 18 .55
No. 200	"	"	" 4	x 6 to 4	x 10 .55
No. 280	"	"	" 4	x 12 to 4	x 18 .75

DUPLEX STEEL WALL HANGERS

No. 500	to carry	Timbers	5 x 8 to 5 x 16.....	$1.00
No. 600	"	" "	6 x 8 to 6 x 14.....	1.25
No 800	"	" "	8 x 8 to 8 x 12.....	1.50
No. 1000	"	" "	10 x 10 to 10 x 12.....	1.60

DUPLEX EXTRA HEAVY WALL HANGERS

No. 600	Extra Heavy	6 x 16, 6 x 18, 6 x 20	..	$2.00
No. 800	" "	8 x 14, 8 x 16, 8 x 18 to 8 x 20.		2.50
No. 1000	" "	10 x 14, 10 x 16, 10 x 18 to 10 x 20..		3.00
No. 1200	" "	12 x 14, 12 x 16, 12 x 18 to 12 x 20..		4.00
No. 1400	" "	14 x 14, 14 x 16, 14 x 18 to 14 x 20..		5.00
No. 1600	" "	16 x 16, 16 x 18 to 16 x 20..		6.00
No. 1800	" "	.. 18 x 18 to 18 x 20..		8.00

DUPLEX CONCRETE BLOCK HANGERS

No. 9	to carry	Joists	2 x 6 to 2 x 14	$ .25
No. 11	"	" "	3 x 6 to 3 x 14	.40
No. 13	"	" "	4 x 6 to 4 x 14	.60

DUPLEX MALLEABLE IRON WALL PLATES

For 6-in.	Beams.....	$ .80
For 8-in.	"	.90
For 10-in.	"	1.00
For 12-in.	"	1.10
For 14-in.	"	1.20
For 16-in.	"	1.30
For 18-in.	"	1.40

WRITE FOR DISCOUNT.

THE DUPLEX HANGER COMPANY

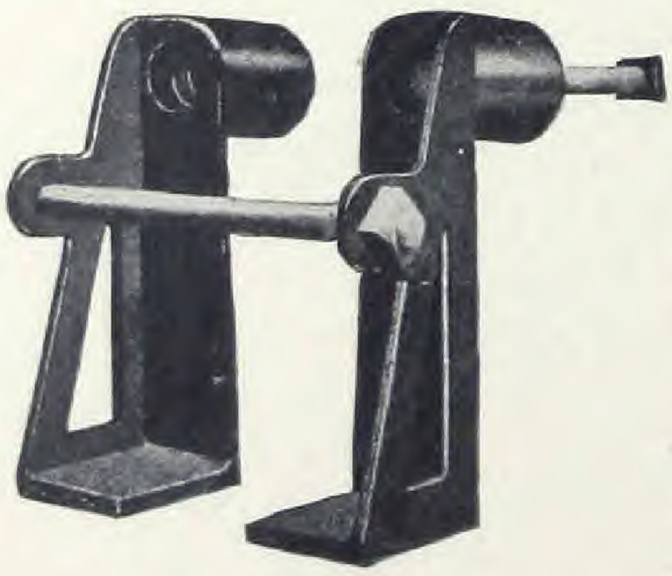
PRICE LIST

DUPLEX JOIST HANGERS

No. 10	to carry	Joist	2	x 6 to 2	x 10	$	.20
No. 14	" "	"	2	x 12 to 2	x 16		.30
No. 15	" "	"	3	x 6 to 3	x 10		.30
No. 18	" "	"	2½	x 6 to 2½	x 16		.40
No. 20	" "	"	4	x 6 to 4	x 10		.35
No. 21	" "	"	3	x 12 to 3	x 14		.45
No. 21X	" "	"	3	x 16 to 3	x 20		.50
No 28	" "	"	4	x 12 to 4	x 14		.60
No. 28X	" "	"	4	x 16 to 4	x 20		.70
No. 53	" "	"	5	x 10 to 5	x 14		.75
No. 53X	" "	"	5	x 16 to 5	x 18		.90
No. 16	" "	"	6	x 6 to 6	x 9		.50
No. 60	" "	"	6	x 10 to 6	x 12		.80
No. 60X	" "	"	6	x 14 to 6	x 16		1.00
No. 80	" "	"	8	x 8 to 8	x 12		1.00

45-degree angle Hangers of all sizes furnished on order.

No. 90	to carry	Timbers	8 x 14 to 8 x 16	$1.50
No. 91	" "	"	10 x 10 to 10 x 14	1.60
No. 92	" "	"	10 x 16 to 10 x 20	2.00
No. 93	" "	"	12 x 14 to 12 x 20	2.50



No. 25R No. 25L	Used in pairs	6 x 6 to 8 x 8	$1.00 a pair without bolts
No. 35R No. 35L	Used in pairs	8 x 10 to 8 x 14 10 x 10 to 10 x 14	$1.25 a pair without bolts
No. 75R No. 75L	Used in pairs	10 x 16 to 10 x 20 12 x 12 to 12 x 20 14 x 14 to 14 x 20	$2.00 a pair without bolts
No. 77R No. 77L	Used in pairs	10 x 22 to 10 x 24 12 x 22 to 12 x 24 14 x 22 to 14 x 24 16 x 22 to 16 x 24	$3.00 a pair without bolts

DUPLEX I-BEAM HANGERS

No. 2	to carry	Joists	2	x 6 to 2	x 16	$	.30
No. 2½	" "	"	2½	x 6 to 2½	x 16		.40
No. 3	" "	"	3	x 6 to 3	x 16		.45
No. 4	" "	"	4	x 6 to 4	x 16		.60
No. 5	" "	"	5	x 8 to 5	x 16		.75
No. 6	" "	"	6	x 8 to 6	x 16		.80
No. 8	" "	"	8	x 8 to 8	x 16		1.00
No. 7R No. 7L	Used in Pairs		10 x 10 to 10 x 16 12 x 12 to 12 x 16			$1.00	a pr.

WRITE FOR DISCOUNT.

Partial List of Buildings Wherein Duplex Hangers and Post Caps are in Use.

Eastern States

Worcester Cons. R. R. Car Barn .....Worcester
Hobbs Mfg. Co. Fact'y.. "
Whitehall Bldg. ..... "
Natl. Packing Bldg.....Springfield
Armour & Co. Bldg.....Lynn
Brookline Mun. Gym.....Brookline
Johnson, Hayward & Piper Factory .....West Somerville
State Bath House.....Revere
Higgins Bldg. .....Waltham
Y. M. C. A. Bldg.....Athol
Y. M. C. A. Bldg.....Somerville
National Soldiers' Home.....Togus
U. S. Naval Training Sta..Newport
French Worsted Mills..Woonsocket
Chase Rolling Mills.....Waterbury
Wallace, Barnes Mfg. Co.....
.....Torrington
Green Street School..... "
Cheney Bros. Mill Bldg.....
.....South Manchester
Strouse Adler Co.....New Haven
Miner, Reed & Garrette "
Winc'ter Rptg. Arms Co. "
Public School Bldgs..... "
So. N. E. Telep. Co.... "
A. F. Woods' Sons..... "
The Patriot Bldg.....Harrisburg
The Arcade Bldg..... "
The Gilbert Bldg..... "
Romberger Warehouse... "
Doehne's Brewery..... "
Graupner Brewery..... "
Brelsford Packing Co.... "
Burns Furniture Bldg.... "
Utica Academy .....Utica
J. B. Wells Sons Co..... "
John A. Roberts & Co..... "
C. C. Kellogg Sons Co..... "
Williams Hotel . ..... "
McLoughlin Block..... "
Foster Bros. Mfg. Co..... "
Mohawk Valley Cap Factory.. "
Klotz Throwing Co.....Scranton
Scranton Button Co..... "
Lackawanna Mills..... "
Groat Knitting Mills..... "
Commercial Bldg. ..... "
J. S. Miller Office Bldg..... "
J. D. Williams & Bro. Co... "
Florence Apartments ..... "
The Rosenbloom Bldg.....Syracuse
Syracuse Rug Co.'s Fact'y.. "
C. W. Ziegler, Son & Dick Bldg. ..... "
Borden Cond. Milk Co....New York
U. T. Hungerford Co. Warehouse ..... "
Kohler & Campbell Fact'y. "
James Reilly Repair & Supply Co. Warehouse.. "
Harlem Market Co. Fact'y "
Strich & Zeider Factory.. "
David Rousseau Factory.. "
Griswold Warehouse..... "
Hess-Goldsmith Silk Mills.....
.....Wilkes Barre
Myers Est. Apt. Bldgs. "
Derr Bldg. ..... "
Bennett Bldg. .... .. "
Fire Dept. Bldg..... "
Rennert Bldg.....Baltimore
Riddle Est. Bldg..... "
Martin Wagner Bldg..... "
Standard Overall Bldg.... "
Builders' Exchange..... "
Weis Bldg. ..... "
Bonaparte Bldg. ..... "
Hospital for Women..... '
Pittsburg Manufacturer's Power Co. Bldg. .....Pittsburg
Oliver-McClintock Bldg... "
Conroy-Prugh Glass Wks.. "
Craig Warehouses..... "
Penna. Glue Co. Bldgs.... "
Fanning Warehouse ..... "
Illinois Leather Co..... "
Columbia Glass Co..... "
Montgomery Warehouse... "
Simon Mfg. Co..... "
Empire Biscuit Co. Fact'y..Brooklyn
New York & Brooklyn Casket Co. ..... "
Wissner Piano Co. Factory "
De Voe & Raynolds Fact'y. "
Hamburgher Bros. Factory "
Pollard & Steinam Factory "
U. S. Gov. Barracks....West Point
Pub. High School Bldg.White Plains
Jones Speedometer Co..New Rochelle
Natl. Enameling & St'mp Co..Berlin
American Oil & Supply Co..Newark
C. E. Cameron, Factory.... "
Wayne Bldg. ..... "
Aug. Goertz & Co..... "
Ball & Co..... "
Universal Castor & Fdry. Co. "
Riley & Klotz..... "
Pyle Pearline Works.....Edgewater
Term. Sta. D., L. & W. R. R. Co.
..... Hoboken
D. E. Cleary Co.....Jersey City
Watts Laboratory.....Summit

Central States

The No. Side High School...Denver
Denver Dry Goods Co..... "
Morse Bros. Warehouse..... "
Kistler Stationery Co..... "
Colo. Telephone Co. Bldg....Greeley
The Kroger Grocery & Baking Co. Warehouse ..... Cincinnati
Carpenter Merc'tile Bldg.. "
Heekin Can Co. Bldgs.... "
Park Flat Bldg..... "
Norwood Transfer Co.....Norwood
Cent. High School Bldg.Kansas City
Loose-Wiles Candy Co.. "
Emery, Bird, Thayer, Warehouse ..... "
Pittsburg Plate Glass Co. "
Hesse Carriage Works.. "
Richards & Conover Hdwr. Co. ..... "
Advance Thresher Co..Battle Creek
Missouri & Kans. Telephone Co.
.....Wichita
Jett & Wood Wholesale Grocery Co. ..... "
Western Newspaper Union.. "
Heystek Bldg.....Grand Rapids
Goodspeed Bros. Fact'y "
Mueller & Slack Bldg. "
C. W. Ryan Warehouse..Great Falls
Ragsdale Bldg. .....Des Moines
Hewitt Wholesale Grocery Bldg. ..... "
Warefield Pratt Howell Co. ..... "
Ewing Invest. Co. Bldg. "
National Biscuit Co..... "
Snell Bldg. .....Fort Dodge
Davenport Can Co.....Davenport
T. W. McClelland Co.... "
Red Jacket Mfg. Co..... "
Lagamarcino, Grupe Co.. "
Louis Hanssen's Sons.... "
John F. Kelley Co..... "
Root Bldg. .....Omaha
Western Chemical Reduction Co. ..... "
Adams & Kelly Bldg..... "
Nash Bldg. ..... "
Fairmont Creamery Co..... "
Y. W. C. A. Bldg..... "
Undeland Bldg. ..... "
Fairbanks-Morse Co.'s Bldg.. "
Alfred Bloom's Planing Mill "
Paxton & Gallagher's W'eh'se "
Amer. Radiator Co.'s Bldg... "

Partial List of Buildings wherein Duplex Hangers and Post Caps are in Use—Continued

Central States—Continued

Johns-Manville Co.'s Bldg..... ..... Milwaukee
Weinbrenner Shoe Co.'s Bldgs. ..... "
Mayer Boot & Shoe Co. "
Berger Bedding Co..... "
American Express Co... "
Kiel Furniture Co..... "
Geuder & Paeschke Mfg. Co. ..... "
Romaka Trunk Factory.. "
Kieckhefer Box Factory. "
Molitor Box Factory.... "
Wm. Frazen Co..... "
Harsh-Edmunds Shoe Co. "
Usinger Bldg..... "
A. Geo. Schulz Box Fact. "
Schoenleber Bldg..... "
Ogden Bldg..... "
Walsh Bldg..... "
Hansen Storage Co..... "
Abbott Motor Car Co.....Detroit
Holiday Paper Box Co..... "
Detroit White Lead Works. "
Roberts Brass Works..... "
Indianapolis Gas Co ....Indianapolis
Van Camp Hardware & Iron Co. ..... "
Schmidt Bros ..... "
Rauh Warehouse..... "
Irwin Warehouse..... "
Reid Sup. Co. W'reh'se.Minneapolis
Minn. Office & School Furn. Co. Warehouse.. "
W. B. & W. G. Jordan Warehouse ..... "
Minn. Moline Plow Co. Warehouse ..... "
American Sprayer Co. Warehouse ..... "
Hamilton Brown Shoe Co. Bldgs. .....St. Louis
Model Bldg..... "
Kennard Carpet Co. Warehouse ..... "
Blackmer Post Pipe Co.... "
Wm. Barr Dry Goods Co.. "
The Paul Brown Bldg.... "
Findeisen & Propf Mfg. Co..Chicago
Edgar A. Bunrell Bldg..... "
Brenmer Bros. Bldg..... "
Illinois Show Case Works... "
Woods Motor Vehicle Co. Factory ..... "

Southern States

Coleman E. Adler Bldg..New Orleans
Lazard Bldg..... "
Rickerts Rice Mill..... "
Swift Bldg..... "
Wimberly & Thomas Warehouse .....Birmingham
Collins Grocery Co.... "
Winter-Loeb Bldg. ....Montgomery
Montgomery High School "
W. O. Brown Buggy Co.....Dallas
Emerson Mfg. Co..... "
Texas Paint Co..... "
G. A. Duerber Mfg. Co..San Antonio
Chatham Woolen Mills..... ..... Winston-Salem
Wood Waste Product Co..... ..... Georgetown

Western States

Chabot Warehouse....San Francisco
Newman Warehouse.. "
Felton Warehouse..... "
Belshaw Warehouses.. "
Holbrook, Merrill & Stetson Co.'s Bldg. "
Elks' Temple .....Portland
Masonic Temple ..... "
Weinhard Bldg..... "
Henry Bldg..... "
Mohawk Bldg ..... "
Failing Bldg. ..... "
Studebaker Co.'s Warehouse "
Advance Thr'her Co. Warehouse ..... "
Fleidner Bldg. ..... "
Hazelwood Bldg .....Portland
Haywood Bros. & Wakefield Co.'s Warehouse.... "
Central Door & Lumber Co. Warehouse ..... "
Concordia Club ..... "
Miller-Reade-Pease Bldg.....Seattle
Klock Bldg..... "
Northern Pacific Bldg..... "
Graves Warehouse ..... "
Seattle Hardware Co. Bldg.. "
Hotel Butler Annex..... "
Rainer-Grand Annex ..... "
Roebling & Sons Warehouse. "
Schwabacher Bldgs..... "
Sunset Telephone Co.'s Bldgs. "
Union Stables ..... "
Henry Warehouse ..... "
Perkins Bldg. ..... "
Alhambra Theatre..... "
S. A. Andrews Bldg.....Tacoma
West & Wheeler Bldg..... "
Tacoma Public Market..... "
Y. M. C. A. Bldg.....Tacoma
Savage-Scofield Bldg..... "
F. S. Harmon & Co. Bldg... "

Canada

Spencer Bldg. .....Vancouver
Davis Chambers ..... "
Clark & Stuart Bldg..... "
Malkin Bldg..... "
Buscombe Bldg. ..... "
Braid Bldg. ..... "
McFeeley Bldg. ..... "
Vancouver W'r'ouses, Ltd. "
P. Burns & Co..... "
The Natl. Drug & Chemical Co. .....Toronto
Millichamp Bldg. ..... "
Christie, Brown & Co..... "
Geo. H. Hees & Co..... "
Amer. Laund. Mach Co.... "
Bredin Bread Co..... "
Canadian Kodak Co..... "
Harris Abattoir Co..... "
Brunswick-Balke Collender Co. ..... "
John C. Green Co..... "
Toronto Plate Glass Importing Co. ..... "
Toronto Laun. Mach'ny Co. "
John W. Cowan.. ..... "
Wm. Neilson, Ltd..... "
J. C. Wilson & Co. Warehouse .....Winnipeg
Thos. Ryan & Co. Wareh'se "
Cockshutt Plow Co. Warehouse ..... "
Tees & Persse Warehouse. "
Walter Woods Warehouse "
Framers' Advocate Bldg... "
Codville & Co. Warehouse. "
Pulford Bldg..... "
Foley, Lock & Larson Warehouse ..... "
Bright & Johnson Warehouse ..... "
Canadian General Electric Co. Bldg. ..... "
Gorham Building.....Montreal
Gazette Building..... "
Jenkins Bros. Ltd..... "
Standard Shirt Co. Ltd..... "
Canadian Spool Cotton Co. Ltd. ..... "
Wobasso Rubber Co..... "
Canadian Rubber Co. Ltd... "
Darling Bros. Ltd. ..... "
Ledoux Carriage Co. Ltd... "
National Drug Co. Ltd.... "
Williams & Wilson, Ltd.... "
Bell Asbestos Miner, Inc.